U.S. DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

ENVIRONMENTAL ASSESSMENT
for the
FIRE MANAGEMENT PLAN
BADLANDS NATIONAL PARK
Jackson, Pennington, and Shannon Counties, South Dakota

Summary: Badlands National Park is a classic grassland fire regime characterized by large tracts of continuous fine fuels, frequent periods of hot, dry weather, and recurrent lightning. Fire is a fundamental ecological process that influences plant and animal diversity and distribution as well as abiotic processes such as erosion, nutrient cycling, and soil genesis.

Both natural and human-caused ignitions have historically influenced the landscape at Badlands National Park. The National Park Service has used prescribed fire as a management tool since the early 1980's at Badlands. The park's existing Fire Management Plan has been in place since 1996 and emphasizes fire suppression and the use of prescribed fire for fuel reduction only along the park boundary. Furthermore, it does not address "wildland fire use"--- the management of naturally ignited wildland fires to accomplish specific pre-stated resource management objectives in pre-defined geographic areas. The National Park Service's Fire Management Policy (*Director's Order #18: Wildland Fire Management*) was revised in 2002, with specific guidance (*Reference Manual #18: Wildland Fire Management*) implemented in 1999. Consequently, the park's existing Fire Management Plan is inconsistent with the new policy.

A new Fire Management Plan has been drafted to address the need for an integrated fire management program consistent with the new management policies. This Environmental Assessment (EA) describes two alternatives and the environmental consequences of each.

Alternative A: No Action. The park's current Fire Management Plan would remain in effect with an emphasis on fire suppression and prescribed fire only for fuel reduction along park boundaries. No natural ignitions would be allowed to burn under any circumstances.

Alternative B: Integrated Fire Management. The park would incorporate wildland fire use as a management tool to preserve and restore the native prairie ecosystem. Prescribed fire would be used for fuel reduction along park boundaries and developed areas, as well as to achieve resource management goals. Wildland fire would be allowed burn in interior portions of the park under specific conditions (wildland fire use). Wildland fires burning in undesired conditions would be suppressed. This is the preferred alternative and its implementation is more fully described in the **Fire Management Plan**.

Alternatives considered but rejected include the use of mechanical treatment for fuel reduction and the exclusion of wildland fire use.

This environmental assessment is an appendix to Badlands National Park's **Fire Management Plan**, which provides specific guidance and procedures for accomplishing park fire management objectives.

The public comment period on this document will remain open for 30 days. **Comments should be received by April 30, 2004,** and may be addressed to:

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CONTENTS

INTRODUCTION

Park Purpose, Significance, and Mission

Badlands National Park was originally authorized in 1929, and established in 1939 by Presidential Proclamation as a national monument, "to preserve the scenic and scientific values of a portion of the White River Badlands and to make them accessible for public enjoyment and inspiration." In 1968 lands on the Pine Ridge Indian Reservation were added (to be managed under an agreement with the Oglala Sioux Tribe), and in 1976 approximately 64,000 acres within the monument were legally designated as wilderness. In 1978 Congress elevated the monument to national park status. In order to preserve many of the values for which this area was set aside, an active fire management program is needed to maintain a pre-European settlement (pre-Columbian) fire-dependent ecosystem. The Fire Management Plan (FMP) is a working document that details how the park will control and/or use fire to maintain park resources for future generations. The FMP is an implementation plan subordinate to, and derived from, the park General Management Plan, the Strategic Plan, and the Resource Management Plan.

Based on park legislation and legislative history, the **purpose** of Badlands National Park (as identified in park strategic planning) is to:

- Protect the unique landforms and scenery of the White River Badlands for the benefit, education, and inspiration of the public.
- Preserve, interpret, and provide for scientific research, the paleontological and geological resources of the White River Badlands.
- Preserve the flora, fauna, and natural processes of the mixed-grass prairie ecosystem.
- Preserve the Badlands Wilderness Area and associated wilderness values.
- Interpret the archeological and contemporary history of use and settlement of lands within the park, with special emphasis on the history of the Sioux Nation and the Lakota People.

The **significance** and unique characteristics of Badlands National Park are as follows:

- The park's geological and paleontological resources of the park provide insight into climatic history, biological diversity, evolution, and geological process particular to the boundary between the Eocene and Oligocene epochs.
- Fossil and geologic records provide a unique opportunity to trace the evolution of the prairie ecosystems of the Great Plains.
- The park contains places of spiritual and historical significance to the Lakota people.
- The harsh climate and extreme geography of the badlands region influenced both aboriginal use and contemporary settlement patterns of the lands now administered by the National Park Service and directly contributed to the establishment of the park.
- The long history of research in the White River Badlands has contributed greatly to the science of vertebrate paleontology in North America.
- The park contains a substantial remnant of native prairie and encloses the largest mixed-grass prairie protected by the National Park Service.
- The park contains large, fully protected prairie dog colonies that provide habitat for the endangered black-footed ferret.

- The park contains spectacular scenery, predominantly highly eroded landforms that comprise a concentrated collection of rutted ravines, serrated towers, pinnacles, and precipitous gulches.

As identified in the park's Strategic Plan, the following is the **mission** of Badlands National Park:

> *Badlands National Park preserves a diversity of significant resources for the education and inspiration of a world audience. These resources are a blend of the best known Oligocene fossil deposits contained within archetypal Big Badlands formations, a rich and varied cultural history spanning from paleo-Indian occupation through the early twentieth century homesteading period, and a fine expanse of a mixed-grass prairie ecosystem. Other qualities, most notably the wilderness character, clean air, quiet, solitude, vastness, and natural processes, provide visitors with a setting for exploration and appreciation through such experiences as hiking, camping, wildlife viewing, scenic drives and vistas, research and educational opportunities, and quiet contemplation.*

Purpose of Action

The purpose of this federal action is to provide a long-range fire management plan and program that restores fire as a fundamental ecological process while protecting people, structures, and adjacent lands from fire. The proposed action is implementation of a long-range fire management plan. As required by the National Environmental Policy Act (NEPA; 42 U.S.C. 4321 *et seq*.), this environmental assessment (EA) analyzes program alternatives and their direct, indirect, and cumulative impacts.

Need for Action

The existing park Fire Management Plan has been in place since 1996 and primarily emphasizes fire suppression and the use of prescribed fire only for fuel reduction along the park boundary. Furthermore, it does not address "wildland fire use", which is the management of naturally ignited wildland fires to accomplish specific pre-stated resource management objectives in pre-defined geographic areas. The National Park Service's (NPS) fire management policy (*Director's Order #18: Wildland Fire Management*) was revised in 2002, with specific guidance (*Reference Manual #18: Wildland Fire Management*) implemented in 1999. Consequently, the park's existing Fire Management Plan is inconsistent with the new policy and requires revision. Because the revisions will be major, an entirely new Fire Management Plan is proposed.

Objectives of Fire Management and Planning

Consistent with NPS policy and the park's resource management objectives, the fire management plan will achieve the following fire management goals (for full discussion, see Fire Management Plan, pages 18-20).

1) *Reduce both the incidence and extent of human-caused fires by 20% within the next 15 years*
2) *Restore fire to 80% of the vegetated landscape within the next 15 years*
3) *Restore fuel and vegetation mosaics to pre-European contact conditions on 25% of the landscape within the next 15 years*
4) *Incur zero fatalities and an injury rate no higher than the national NPS average in association with wildland fire management activities*

5) *Limit impacts from fire suppression activities to less than 5% of the estimated monetary value of the impacted resource*

More specific objectives related to individual vegetation types may be found in the Fire Monitoring Plan (*Appendix F* of the Fire Management Plan). Also, each prescribed fire plan for individual prescribed fires will include specific resource goals and objectives which will be refinements of, and compatible with, these program objectives.

Issues and Impact Topics included in this EA

In September 1999 a press release to area newspapers invited the public to identify issues and concerns related to several park planning efforts, including the proposed Fire Management Plan. Additionally, in fall of 2000, the park conducted scoping for the General Management Plan. These efforts identified the following issues to be addressed by this plan:

- *ISSUE:* Fire events within the park may have an adverse impact on archaeological resources, but the subsequent removal of thatch may also provide an opportunity to conduct a more thorough inventory.
- *ISSUE:* Wildland fires near park boundaries pose a risk to park neighbors.
- *ISSUE:* Fire may generate large volumes of smoke, reducing the air quality of the park and surrounding lands.
- *ISSUE:* Wilderness should be included as a specific resource category in the assessment of environmental impacts.
- *ISSUE:* Natural processes should prevail within Wilderness. Naturally ignited fires should be given priority over prescribed fire within Wilderness.

The following impact topics are included in this Environmental Assessment:

Vegetation Resources: The frequency, duration, and seasonality of fire have direct impacts on the composition and distribution of plant species. The suppression of fire has an indirect impact on the composition and distribution of plant species. Specific impacts to grassland, shrubland, and woody draw communities will be addressed. Direct and indirect vegetation impacts are therefore analyzed in this EA.

Wildlife Resources: The distribution and frequency of fire have direct impacts on populations of small mammals, ungulates, birds, reptiles and amphibians, and invertebrates. Fire may have a marked affect on predator-prey relationships between these populations by reducing the amount and availability of cover, thus increasing animal predation on small mammals. It can also destroy nests and kill young animals. Direct and indirect wildlife impacts are therefore analyzed in this EA.

Fire can also change wildlife habitat and forage quality. Fire's effects on habitat depend on fire characteristics. Soils lose fewer nutrients in low-severity fire than in severe fire. Severe fire volatilizes nutrients and occasionally decreases wettability of the soil surface. Forage is improved when low-severity fire increases herb diversity and stimulates plant growth, particularly among native legumes. Improved nutritional levels in forage species can occur following fire.

Threatened and Endangered Species: The Endangered Species Act of 1973 (16 U.S.C. 1531 *et seq*.) prohibits federal agencies from taking actions that jeopardize the continued existence of listed species or to adversely modify critical habitat. Under Section 7 of the Act, agencies must consult with the US Fish and Wildlife Service before undertaking any action with such potential. NPS *Management Policies* (2001) require assessment of impacts to certain state-listed rare, candidate, declining and sensitive species. Within the state of South Dakota there are a total of 35 threatened, endangered, and candidate species of invertebrates, fishes,

reptiles, amphibians, birds, mammals, and plants. From this list there are a total of three avian and four mammalian species documented as known to be, or known potentially to be, resident or migrant species within the local area of Badlands National Park. Bird species that are migrant and seasonally resident in the area are the federally threatened/state endangered bald eagle (*Haliaeetus leucocephalus),* the federal/state endangered whooping crane (*Grus americana*), and the state endangered peregrine falcon (*Falco peregrinus*). Infrequent sightings of the state threatened mountain lion (*Felis concolor*) have been documented within the park. The park includes large colonies of the black-tailed prairie dog (*Cynomys ludovicianus*), a species considered warranted for but precluded from listing by the US Fish and Wildlife Service at this time. These colonies provide a prey base and critical habitat for the reintroduced federal and state endangered black-footed ferret (*Mustela nigripes*) and potentially the state threatened swift fox (*Vulpes velox*). Prairie dog communities occur throughout the park and would be subjected to wildland fire use and possibly to wildland fires. Direct impacts to these communities and the seven species mentioned above are therefore analyzed in this EA. Two state listed rare plants are known to occur in the vicinity of the park: Dakota buckwheat (*Eriogonum visheri*) and Barr's milkvetch (*Astragalus barrii*). However, both occur on sparsely vegetated badlands where it is highly unlikely for fire to occur. Therefore, impacts to these two plant species are not analyzed.

Air Quality: The Badlands Wilderness Area is a Class I airshed as designated by the federal 1963 Clean Air Act (42 U.S.C. 7401 *et seq*.). This designation stipulates that federal land managers have an affirmative responsibility to protect a park's air quality from adverse air pollution impacts. Air quality would be affected to various degrees by fire events inside the park. In addition, smoke generated inside the park could affect sensitive receptors outside of the park. Visibility would be affected by the presence of particulates associated with smoke. However, the short duration of most grassland fire events would make contributions to acid deposition or ozone unlikely. Direct, indirect, and cumulative impacts to visibility are therefore analyzed in this EA.

Paleontological Resources: Badlands National Park is world renowned for its paleontological resources. A report that accompanied the 1929 act creating the park described the Badlands as containing "vast beds of vertebrate remains." The spectacular vertebrate fossils preserved within the White River Badlands have been studied extensively since 1846 and are included in museum collections throughout the world. Paleontological resources exposed at the surface may undergo splitting, cracking and discoloration when exposed to fire. Vehicle or foot traffic, which accompanies prescribed burn and fire suppression activity, can potentially crush delicate fossil remains. Direct impacts to fossil resources will be analyzed in this EA.

Wilderness: The Wilderness Act of 1964 (16 U.S.C. 1132) and *RM-41,: Wilderness Preservation and Management* require consideration of impacts on Wilderness resources. The Badlands Wilderness Area within Badlands National Park was designated to preserve wilderness values, including wilderness visitor experience and physical wilderness character, as well as natural resources and processes. The boundaries of the Wilderness area would be subjected to prescribed fires, and the interior of the Wilderness may experience wildland fires and wildland fire use. Therefore, direct, indirect, and cumulative impacts to these wilderness values are analyzed in this EA.

Cultural Resources: The National Historic Preservation Act, as amended in 2000 (16 U.S.C. 470 *et seq*.), and the NPS Cultural Resource Management Guidelines and Policies require consideration of impacts on cultural resources listed on or eligible for listing on the National Register of Historic Places. No parkwide inventories have been initiated to evaluate whether there are National Register-eligible historic structures, cultural landscapes, or any ethnographic resources. One structure, the Ben Reifel Visitor Center, was determined in 2002 as eligible for the National Register. Potentially eligible archaeological and other cultural resources may be

affected by fire events. Consultation with the State Historic Preservation Officer has been consistent and documented on all undertakings shared with the cultural resource manager.

Archaeological Resources: Research has been conducted on the impacts of fire on archaeological resources. In 2002, Brent Buenger, a PhD. candidate at Colorado State University in the Department of Anthropology, submitted *Fire Effects on Archaeological Resources During Prescribed and Wildlife Fire in a Prairie Ecosystem (Badlands National Park, Wind Cave National Park, Rocky Mountain National Park)* and determined:

> Prescribed burning in grassland fuels produced relatively low temperatures and residence times. Surface temperatures recorded during a May, 2001 burn ranged from 418.8C to 61.6C. The maximum subsurface temperature was 34.6C. The investigator's findings indicate that thermal alteration of the artifacts placed within the test plots was not significant. The majority of discoloration was due to residence deposits, the byproduct of organic combustion, present on all of the artifacts. No significant damage in the form of cracking, spalling, or deformation occurred. Even the wooden objects showed only minor effects of the fire. Based on these observations, it is suggested that prescribed burning in mixed grass fuels presents only a minimal risk to surface artifacts and little or no risk to subsurface artifacts.

Therefore, the impacts analyzed in this EA focus on the impacts resulting from fire activities such as driving vehicles across the prairie rather than the impacts of the fire itself.

Cultural Landscapes: A Cultural Landscape Report and Environmental Assessment of Cedar Pass Headquarters area was started in 2002. A project entitled *Cultural Landscapes Important to the Oglala Lakota* was funded in 2002 but deferred to 2004 until issues relating to management of the South Unit are resolved. The park is scheduled for a parkwide Cultural Landscape Inventory in 2004 and 2005, according to the Midwest Region Cultural Landscape Inventory Program.

Ethnographic Resources: A draft Ethnographic Overview was received in 2001. The plant species discussed as important to the Lakota people, such as sagebrush, sumac, chokecherry, yucca, and cacti have root structures that have adapted to survive prairie fire. The substructures of these plants are not consumed by fire but instead thrive through exposure to fire. Additionally, the native wildlife populations are also positively impacted by fire as it creates opportunities for new plant shoots to appear for grazers and browsers. Fire was historically used as a tool to draw native prairie animals out for hunting purposes. The ethnographic overview specifically states, “Scholars have long been inclined to believe that the Great Plains ecosystem was fundamentally maintained by fire. Many have seen this as substantially of human origin, while other think natural fires were as important or more so.” The overview lists the following historic and prehistoric uses for fire by the Plains Indians: to drive game, to improve forage, to concentrate wildlife in unburned areas, and for use as a weapon. Accidental fires or campfires were also likely sources. The overview goes on to state, “More important than the causes of fire is the matter of fire suppression; this practice, beginning with White land management regimes, is what threatens the long-term viability of grassland ecosystems.” Consultation with Tribes affiliated with Badlands National Park has been initiated.

Museum Collections: Specimens and artifacts in the park museum collections will be not impacted by the fire. These items have been collected for research purposes and provide relationships to the significant history of the science of paleontology, the human history of settlement in the White River Badlands, and document the history of the development of Badlands National Park. These resources will not be impacted and are therefore dismissed as an impact topic.

Public Health and Safety: Fire on the landscape poses obvious threats to public health and safety. Smoke can cause severe respiratory difficulty, particularly in children and the elderly. Visibility on roadways can be severely reduced, leading to vehicular collisions. Uncontrolled fire

can threaten lives and property. Effects of fire on public health and safety will be addressed in this EA.

Issues and Impact Topics Considered but not further addressed in this EA

Water Resources: National Park Service policies require protection of water resources consistent with the Clean Water Act (33 U.S.C. 1251 *et seq*.). Burned areas may be subjected to erosion that would result in a temporary increase in sediment loading of surface waters. However, this increase is negligible given the naturally high rates of erosion and sediment loading that characterize the badlands landscape. Sparsely vegetated and highly erodable badlands constitute 44,400 hectares (109,700 acres), or 46 percent of park acreage, and annual acreage burned under any realistic fire management program would be no more than 4,000 hectares (10,000 acres), or 4 percent of the total park acreage. Plus there is generally a short time period between a fire event and vegetative regrowth, which stabilizes the soil and limits the period of post-burn erodability. Therefore, erosion increase from fire is likely to be negligible, and this impact topic is not included for further analysis in this EA.

Geologic Resources: National Park Service policies require protection of geologic resources and processes. Burned areas may experience increased rates of erosion for short periods of time following burns. However, this increase would be negligible given the short duration of the increase and the naturally high rates of erosion that characterize the badlands landscape. Therefore, this impact topic is not included for further analysis in this EA.

Socioeconomics: NEPA requires an analysis of impacts to the human environment, which includes economic, social, and demographic elements in the affected area. The area surrounding the park is primarily ranch land with a few small communities. Fire events may bring a short-term need for additional personnel in the park, usually provided by the local volunteer fire departments, but would not affect the communities' overall population, income, or employment base. Therefore, this impact topic is not included for further analysis in this EA.

Environmental Justice: Executive Orders 12250, 12898 and 12948 require agencies to consider the impact of their actions on disadvantaged human populations. The Pine Ridge Indian Reservation is an economically depressed area. The suppression of wildland fire and the use of prescribed fire would be generally consistent with the Bureau of Indian Affairs fire management program in place on the Reservation. Communities in and near the Reservation would be protected as diligently as other adjacent communities, and there would be the same opportunities for Tribal fire crews to participate in the park's fire management activities. Therefore, this impact topic is not included for further analysis in this EA.

Visitor Use: NPS *Management Policies* (2001) require parks to provide for visitor use. Fire events may require visitor use closures for visitor protection. However, the displacement of visitors would be temporary and localized due to the discontinuity of fuels and the burn unit distribution. Generally, similar visitor experiences would be available in other areas of the park. The park's Media Plan, developed to accompany the Fire Management Plan, would be implemented when needed. Interpretive programs to explain the role of fire in the landscape are generally well received, and many visitors are curious about fire. Thus, fire operations may provide a desirable visitor experience. Therefore, this impact topic is not included for further analysis in this EA.

Park Operations: Fire events may redirect park personnel with fire qualifications from their usual responsibilities. However, the advanced scheduling of prescribed burns and the use of a weekly call-out list for response to unwanted wildland fires would allow managers to anticipate needs and develop a strategy to continue essential park operations. Therefore, this impact topic is not included for further analysis in this EA.

Adjoining Lands: The park is primarily surrounded by rangeland and ranches. Much of the surrounding land is US Forest Service, Buffalo Gap National Grassland, and Pine Ridge Indian Reservation, which leases much of it's acreage to local ranchers for grazing. Other land is private rangeland or cropland. Small communities, Wall, Scenic, and Interior, are also located near the park and could be affected by the fire program. Direct impacts to be considered are those from smoke and vegetative impacts from fires that start in the park and escape to surrounding lands. Smoke is addressed an Air Quality impact in this EA. Under any fire management scenario, risk to adjoining lands is similar. Badlands will work to prevent any ignition within the park from burning across the boundary, except where we are conducting a cooperative prescribed fire with the US Forest Service. Therefore, impacts to adjoining lands will not be addressed in this fire plan.

Compliance and Authority for Action

National Park Service management policy directs each park to prepare a wildland fire management plan appropriate for that park's purpose and resources. Fire management at Badlands National Park is based upon this policy and the guidance found in *RM-18: Wildland and Prescribed Fire Management Policy* (1999) and *Wildland and Prescribed Fire Management Policy: Implementation Procedures Reference Guide* (1998). These guidelines identify fire as the most aggressive natural resources management tool employed by the National Park Service. NPS policy also directs that all fires burning in natural vegetation be classified as either wildland fires or prescribed fires. Prescribed fires and wildland fire use may be authorized by an approved fire management plan and can be of significant importance in achievement of the park's resource management objectives. More detailed information regarding fire policy can be found in *Section II: Policy Compliance* of the Fire Management Plan. The draft Fire Management Plan for Badlands National Park has been prepared in compliance with these policies.

The National Environmental Policy Act of 1969 (NEPA), as amended, requires all federal agencies to prepare in-depth studies of the impacts of, and alternatives to, proposed major federal actions; use information contained in such studies in deciding whether to proceed with the action; and involve the interested and affected public before any decision affecting the environment is made. Specific policy and procedures by which the NPS will comply with NEPA are set forth in *RM-12: Conservation planning, Environmental Impact Analysis, and Decisionmaking*. This Environmental Assessment for the Fire Management Plan for Badlands National Park has been prepared in compliance with these policies.

ALTERNATIVES

Alternatives are different ways of meeting stated purpose of this project, which is to implement a long-range fire management program to restore fire as a fundamental ecological process while protecting structures and adjacent lands from fire. To this end, two alternatives are fully analyzed and several alternatives are considered but rejected because they do not fulfill the purpose of this project or they are inconsistent with NPS policy.

To better enable the reader to follow the discussion presented, the following terms are defined in *RM-18* and are provided here for easy reference:

- *Control:* This strategy reflects aggressive suppression efforts and would be the strategy of choice whenever the imminent threat to life or property exists or when fire behavior is potentially extreme.
- *Containment:* The spread of the fire under prevailing and forecasted weather conditions to

the fullest extent possible to minimize resource damage, and to restrict an unwanted wildland fire to a defined area. This strategy would be utilized when no significant values are at risk and fire behavior predictions preclude direct attack to assure firefighter safety. Consultation with adjacent landowners may be initiated before this tactic is selected.

- *Confinement:* Confinement entails minimal suppression action intended to limit fire spread to a certain acceptable geographic area. This strategy may be utilized depending on size, irregular boundaries, and the values of resources at risk adjacent to the park.
- *Fire Management Unit (FMU)*: Any land management area definable by objectives, topographic features, access, values-to-be-protected, political boundaries, fuel types, or major fire regimes, etc., that sets it apart from management characteristics of an adjacent unit. FMUs are delineated in Fire Management Plans. These units may have dominant management objectives and pre-selected strategies assigned to accomplish these objectives. Within each FMU, prescribed fire units may be also be delineated.
- *Wildland Fire Use*: The management of naturally ignited wildland fires to accomplish specific pre-stated resource management objectives in pre-defined geographic areas outlined in Fire Management Plans.
- *Prescribed Burn or Fire*: Any fire intentionally ignited by a management agency to meet specific objectives. A prescribed fire plan must be prepared and approved in advance. NEPA requirements must be met, prior to ignition. Prescribed fire units simply delineate the geographical extent of each planned prescribed fire treatment.
- *Wildland Fire Suppression*: An appropriate management response to wildland fire that results in curtailment of fire spread and eliminates all identified threats from the particular fire. All wildland fire suppression activities provide for firefighter and public safety as the highest consideration, but minimize loss of resource values, economic expenditures, and/or the use of critical firefighting resources.

Alternatives Analyzed in this EA

Alternative A - No Action: Status Quo

Under this alternative, the park's fire management program would continue to operate under the existing Fire Management Plan that was adopted in 1996. This plan is inconsistent with the NPS fire policies adopted in years since its approval that prescribe specific analysis and use of templates. However, this alternative is included because NEPA requires analysis of the no action alternative as a baseline by which to compare proposed alternatives.

Under the 1996 plan, all wildland fires in Badlands National Park are suppressed. All suppression efforts are directed toward safeguarding life and property while protecting park resources from harm. All fires are evaluated to determine the appropriate suppression strategy. There is no Fire Management Unit that allows for wildland fire use. Wildland fires are suppressed in such a manner as to reduce threat to human life and facilities while ensuring adequate protection of natural and cultural resources. Prescribed fire is utilized as an appropriate management tool.

Three fire management units are delineated for the park. Where logical the units follow boundaries of the existing park management zones. However due to the complexity of both the topography and the surface ownership that exists at Badlands National Park, fire management units are tied to ownership and natural topographic boundaries. Appropriate fire management strategies are identified for each unit, considering vegetation, terrain, fire behavior/effects, cultural resources, access, developed areas, political boundaries and protection of life and property.

Fire Management Unit #1: Includes all non-wilderness in the Pinnacles and Cedar Pass Districts. The boundary interface (approx. 1/4 mile wide) throughout the Pinnacles and Cedar Pass Districts boundary is included. Also included are all developed areas in the Pinnacles and Cedar Pass Districts. Total Unit size is approximately 46,500 acres. Unit objectives:

a) When possible suppress fire under a control strategy.
b) Utilize prescribed fire to reduce heavy fuel loadings and reintroduce prescribed fire for prairie restoration into areas that cannot support wildland fire use due to other management concerns.

Fire Management Unit #2: Consists of the designated Wilderness Area (most of which is in the Sage Creek drainage), approximately 64,000 acres. Unit objectives:

a) When possible suppress fires on isolated tables under a confine strategy.
b) When possible suppress all other fires under a "containment" suppression strategy.
c) Prevent fire from spreading northward and westward toward private land and bison corrals.
d) Protect woody draws.
e) Protect forage base utilized by insular wildlife populations.
f) Reintroduce fire for prairie restoration into areas that cannot support wildland fire use due to management concerns.

Fire Management Unit #3: Encompasses the park's Stronghold and Palmer Creek Districts, approximately 133,300 acres. This Unit includes the White River Visitor Center complex. It is also extremely rugged with limited access. Because the South Unit of the park (which includes the Stronghold and Palmer Creek Districts) is managed cooperatively with the Oglala Sioux Tribe and currently has cattle grazing on it, management objectives are different from the other fire management units. Unit objectives:

a) Suppress wildland fires in the vicinity of the White River Visitor Center complex under a control strategy.
b) Suppress wildland fires in the remainder of the Unit under a contain strategy.
c) Explore with the Oglala Sioux Tribe and the Bureau of Indian Affairs the possibility of using management-ignited prescribed fire as a management tool, particularly for bighorn sheep habitat management and revitalization of grazing allotments.

Management-ignited prescribed fire would be used as a management tool for resource management, hazard fuel reduction, monitoring, and research. The intention of the park has been to reintroduce fire into prescribed fire units in an effort to replicate the historical fire frequency (5-20 years). Approximately 4500 acres would be burned annually.

Summary of *Alternative A:*

- 3 Fire Management Units: FMU 1 = boundary interface (46,500 acres); FMU 2 = designated Wilderness (64,000 acres); FMU 3 = South Unit (133,300 acres)
- FMU 1 employs prescribed fire and suppression to reduce fuel along the boundary and restore/preserve native prairie
- FMU 2 employs suppression and containment of wildland fire; some prescribed fire
- FMU 3 employs suppression at this time, but looks to reach agreement with Oglala Sioux Tribe for use of prescribed fire
- No use of wildland fire is allowed
- Approximately 4,500 acres per year burned via prescribed fire

Alternative B (Preferred) - Comprehensive Fire Management Program

Under this alternative, the draft Fire Management Plan would be adopted. As described, the park would be divided into two Fire Management Units: A suppression unit, termed the "Boundary FMU"; and a wildland fire use unit, termed the "Natural FMU". These units would be delineated along administrative and natural barriers representing locations suitable for defensive fire tactics. These FMUs would be used to drive fire management actions in various areas of the park. The Natural FMU would be managed with a combination of prescribed fire, wildland fire use, and wildland fire suppression, while the Boundary FMU would only utilize suppression and prescribed fire. Appropriate firefighting strategies and tactics would be employed for all unwanted wildland fires occurring as the result of human ignitions. Prescribed fires would be implemented in both FMUs when it has been determined through development of a prescribed fire plan for a specific fire unit that clearly articulated resource objectives identified in the plan can be accomplished for that fire unit.

The Boundary FMU covers approximately 191,000 acres, primarily adjacent to the park boundary and in developed areas. The entirety of the South Unit is also classified as a Boundary FMU because this area is tribal land located within Pine Ridge Indian Reservation and the tribe has grazing interests and other activities that may be negatively affected by wildland fire use. In this zone wildland fires would be suppressed by hand tools and/or mechanical equipment to prevent fire spread. Prescribed fire would be used as a tool for resource management, monitoring, and research to simulate a natural ecological process in the North Unit only at this time. In addition, prescribed fire would be used in this zone to reduce fuel load and thereby reduce the potential for wildland fire damage of park resources, tribal interests, and adjacent lands. The Boundary FMU contains 23 prescribed fire units. The prescribed fire accomplishments within the Boundary FMU would be nearly 4000 acres per year averaged over fifteen years, with each unit burning at least once every fifteen years to replicate the historic fire frequency of 5-20 years. Each of the prescribed fire units has been placed in a burning cycle based on past burns, as well as on park needs and objectives. Boundaries for the prescribed fire units are based on physical barriers (badlands/roads) to minimize the need for fire line construction. The prescribed fire unit map is presented below can be found on page 22 of the Fire Management Plan.

The Natural FMU covers approximately 53,400 acres and is located in the interior of the Badlands Wilderness Area. In this zone, wildland fires would be allowed to interact with the fire dependent communities to maintain the natural variability of the ecosystem. Monitoring of current and expected weather and associated fire dangers would be immediately implemented. Availability of sufficient wildland firefighting resources would be ensured should the weather change or the criteria are not being met (more details of fire management within the Natural FMU are provided in Chapter IV of the Fire Management Plan). The Natural FMU has four identified fire use/prescribed fire units that may be treated as prescribed fire units. The appropriate management response would be determined and utilized for all wildland fires occurring in the Natural FMU, provided the annual burn acreage accomplishment within the Natural FMU would not exceed 10,000 contiguous acres for all wildland fire types (suppression, prescribed fire and wildland fire use acres combined). This acreage limitation is directly tied to ungulate populations and is intended to ensure adequate forage during the winter season.

Summary of *Alternative B*:

- 2 Fire Management Units: Natural FMU (53,400 acres) and Boundary FMU (191,000 acres)
- Natural FMU employs wildland fire use, prescribed fire, fire suppression
- Boundary FMU employs prescribed fire and suppression only
- South Unit would be part of the Boundary Unit, with an intent to work with the Oglala Sioux Tribe on an agreement to conduct prescribed fires
- Both units look to use fire to restore/preserve native prairie
- Approximately 4,000 acres per year to be burned via prescribed fire; 10,000 acres total to be burned per year including both prescribed and wildland fire

Alternatives Considered but not further Addressed in the EA

Allow wildland fires to burn without human intervention: This alternative was considered initially to determine its extent of impacts and resource benefits. This alternative would create a significant risk to lives, property and park resources. The preferred alternative allows for wildland fires in the Natural FMU, but only under certain conditions and criteria. Allowing uncontrolled wildland fires would not meet resource objectives and could potentially violate a number of state and federal resource laws; therefore, it was not analyzed further.

Mechanical treatment: Removal of fuel by mechanical means is not useful in the grassland fuels of Badlands National Park. This treatment most often employs chainsaws to remove woody fuels (i.e. trees) to reduce fuel loads. Less than 5% of the land cover at Badlands is composed of widely scattered woodland or shrublands and the remainder is grassland or sparsely vegetated badlands. Therefore, the only mechanical treatment available is mowing, however, the rugged terrain and rapid growth of grasses during the summer months preclude mowing as a viable fuel reduction treatment. Furthermore, widespread or frequent mowing would cause unacceptable visual impacts to the park's prairie resources (long lasting tracks from the mower) and tends to encourage encroachment by non-native plant species. Due to the impracticality of mechanical treatment to achieve fuel reduction and the unacceptable impacts of mowing, this alternative was not further analyzed or incorporated into other alternatives.

No Prescribed Fire: The NPS mission is to protect and preserve the native ecosystems it manages for the enjoyment of future generations. Guided by this mandate, the national fire management program focuses on restoring and maintaining fire as a natural process while protecting human life and property. Furthermore, RM-18 directs parks to scientifically manage wildland fire using best available technology as an essential ecological process to restore, preserve, or maintain ecosystems and use resource information gained through inventory and monitoring to evaluate and improve the program. To help in achieving these long-term goals, the NPS has a comprehensive fire management program including hazardous fuels reduction, prescribed fire, wildland fire for resource benefit, and wildland fire suppression (NPS Appropriations Implementation, 2001). Native species in Badlands National Park evolved with fire, and many are dependent upon fire for their continued survival. Natural fire events are fewer due to the discontinuous fuels associated with urban and agricultural landscapes surrounding the park, making prescribed fire necessary to replicate historic fire frequency. Because the absence of prescribed fire would result in degradation of the native grassland ecosystem at Badlands National Park, this alternative was not further analyzed or incorporated into other alternatives.

Environmentally Preferred Alternative

The Environmentally Preferred Alternative is Alternative B, which is also the agency Preferred Alternative. This alternative has the greatest long-term positive environmental impacts with the least negative impacts. Specifically, the Preferred Alternative has significant long-term positive impacts by restoring a natural process that would support native plant growth and survival, and generally inhibit invasive non-natives. By supporting native plant species and communities, the Preferred Alternative would also have long-term benefits for the native mixed-grass prairie ecosystem as a whole.

Summary Matrix of Alternatives

Elements	Alternative A: No Action	Alternative B: Comprehensive
Acres of Boundary Fire Management Unit	244,400	191,000
Acres of Natural Management Unit	0	53,400
Average number of acres treated by prescribed fire annually	4500	4000

Summary Matrix of Impacts of Alternatives

Impact Topic	Alternative A: No Action	Alternative B: Comprehensive
Vegetation Resources	Long-term, minor positive	Long-term, major positive
Wildlife Resources	Long-term, major negative	Long-term, major positive
Threatened/Endangered Species	Short-term, minor negative	Short-term, minor negative
Air Quality	Short-term, minor negative	Short-term, moderate negative
Paleontological Resources	Long-term, moderate negative	Long-term, minor negative
Cultural Resources	Long-term, moderate negative	Long-term, moderate negative
Wilderness	Long-term, moderate negative	Short-term, minor negative
Public Health and Safety	Short-term, minor negative	Short-term, minor negative

AFFECTED ENVIRONMENT

Vegetation Resources

Badlands mixed grass prairie vegetation is characteristically diverse and found throughout the park. The basis for the difference between pre-settlement vegetation composition and current conditions is found in past livestock grazing practices, elimination and reduction of native wildlife and suppression of fire. With the elimination of livestock grazing, managed cultivation, restoration of fire, and concentrated resource management efforts, the current vegetative mix largely reflects what is believed to have naturally existed prior to the influx of the European settlers in the park locale.

Completed in 1999, the park's Vegetation Map project classified and digitally mapped 0.9 million acres including the entire park and surrounding areas. Vegetation map classes were determined through extensive field reconnaissance, data collection, and analysis in accordance with the National Vegetation Classification System. The vegetation map was created from photographic interpretation of 1997, 1:12,000 scale color infrared aerial photography. The National Vegetation Classification System for the Badlands study area includes twenty-eight natural and semi-natural associations and two complexes. The natural associations are comprised of four woodland, ten shrubland, six upland herbaceous/grassland, four wetland and

four sparse vegetation types. The semi-natural associations are comprised of one woodland type and three grassland types (Von Loh et al. 1999).

Woodlands occupy 3,565 acres (1,443 ha) and are minor components of the regional vegetation, covering approximately 1.5% of the park. These are generally restricted to floodplains, drainage bottoms, toeslopes of sandhills, draws associated with eroding buttes, and slumps on butte and cliff faces. Rocky Mountain juniper (*Juniperus scopulorum*) forms the most common woodland in the project area, occurring as its purest form on drier slopes, along butte edges, and in upper draws. A special habitat occupied by Rocky Mountain juniper is a side-slope slump, where additional moisture collects following landslides. Such areas are known as juniper slumps and are generally isolated from surrounding fine fuels and thus not subjected to natural fire occurrence except from direct lightning strike.

Rocky Mountain juniper often intergrades with other woodlands, especially ponderosa pine (*Pinus ponderosa*) and green ash (*Fraxinus pennsylvanica*). Ponderosa pine woodlands occur in the upper elevations of the South Unit, where cover values for ponderosa pine and Rocky Mountain juniper are often nearly equal. Throughout the park's lower elevations, Rocky Mountain juniper and hardwood trees also intermix along a broad gradient, with hardwoods occupying sites with more soil moisture. Green ash and American elm (*Ulmus americana*) are the most common hardwood trees present, occupying bottoms of draws, river floodplains, and toeslopes of sand hills. The upper portion of hardwood draws is commonly dominated by various shrub species, particularly American plum (*Prunus americana*) and western snowberry (*Symphoricarpos occidentalis*). Many of the deciduous woodland species are fire dependent and sprout vigorously after fire (FEIS 1996).

Wetter sites with high soil moisture within the park support stands of Eastern or plains cottonwood (*Populus deltoides*) trees. Along with peachleaf willow (*Salix amygdaloides*), these typically occur within the park as small clumps along minor streams, around seeps, springs, and around ponds. The tree species found in these floodplain and wetland communities are generally not tolerant of fire (FEIS 1996).

Shrublands occupy 10,073 acres (4,076 ha) and compose approximately 4.2% of the park's area. Shrublands occur mainly along river and creek floodplains, and on sand deposits, slopes with more soil moisture, and draws. The most widespread of all shrublands is silver sagebrush (*Artemisia cana*), which occurs regularly on floodplains and adjacent slopes. Silver sagebrush is usually found sparsely scattered throughout western wheatgrass (*Pascopyrum smithii*) grasslands. In certain areas it may become quite dense or intermingle with other shrubs. Most of the native shrub species are fire tolerant and many are fire dependent, experiencing increased germination rates and/or vigorous sprouting after fire (FEIS 1996).

Sand hills support extensive stands of sand sagebrush shrubland (*Artemisia filifolia*), particularly in the southern half of the park and project area. Where sand hills are reduced to sandy ridges or flats, stands of yucca (*Yucca glauca*) may replace or intermingle with sand sagebrush. Most yucca stands are located along the margins of buttes, on low sandy ridges, and on dry canyonsides. Plant species that inhabit sandhills are generally fire tolerant (FEIS 1996).

Draws, swales, slopes, and drainages throughout the study area provide enough moisture to sustain patches of various broad-leaved shrubs, in addition to the silver sagebrush described above. Among the more common are western snowberry, American plum, and occasional three-leaved sumac (*Rhus trilobata*). Western snowberry is the most prevalent; occurring as relatively small stands or clones at the heads of draws or covering low swales. American plum often occurs adjacent to western snowberry or within openings of green ash. American plum typically grows in clumps that produce almost impenetrable thickets. Three-leaved sumac is present at the park as both very dense (moist conditions) and very sparse (dry condition) shrubland types.

Typically, this shrubland occurs as sparse stands along the rims of buttes. All of the native shrub species in this vegetation type are fire tolerant or fire dependent (FEIS 1996).

The remaining shrublands represent relatively rare types found only in a few locations in and around the park. Sandbar willow shrublands grow in saturated ox-bows or cut-banks of Sage Creek in the North Unit and Fog Creek in the South Unit. Habitat similar to and slightly drier than that of sandbar willow may contain clumps of silver buffaloberry (*Shepherdia argentea*). Greasewood shrublands are known only from two small patches on Cuny Table in the South Unit and a small hilltop in the Badlands Wilderness Area of the North Unit. Finally, rabbitbrush (*Chrysothamnus nauseosus*) shrubs become dominant in disturbed sites throughout the project area, such as areas of road-construction. These shrub species have varied responses to fire that are highly dependent upon season, intensity, and duration of fire exposure (FEIS 1996).

Sparse vegetation can be found within areas of established prairie dog towns, covering approximately two percent of the park. Prairie dog towns occupy deeper soils on large flats dissected by drainages, such as in the Conata Basin. Prairie dogs through their cycle of burrow establishment, grazing, and burrow abandonment, may alter grassland vegetation types over time. This constant use causes the native vegetation to revert back to an early successional state dominated by annual forbs, some of which are non-native weeds. Fire generally does not carry easily into the sparse vegetation surrounding prairie dog burrows.

There is a diverse grassland mixture that intermingles in small units across the landscape, occupying approximately forty-five percent of the park. Western wheatgrass is the predominant grass occurring in the project area. This sod-forming grass thrives on clayey soils where it ranges from almost pure, monotypic stands on clay to a true mixed grass prairie on silty/sandy clays or loamy clays. Common associated species include various forbs and grasses such as prairie coneflower (*Ratibida columnifera*), white milkwort (*Polygala alba*), needle-and-thread (*Stipa comata*), and prairie dropseed (*Sporobolus heterolepis*). Almost all of the native grass and forb species of these grassland communities are fire tolerant and many are fire dependent (FEIS 1996).

Two non-native annual grasses, Japanese brome (*Bromus japonicus*) and downy brome (*B. tectorum*) are also usually present to some degree in all grassland associations, especially western wheatgrass stands. Non-native annual grasses may be decreased with fire (FEIS 1996, Whisenant 1987). Western wheatgrass also tends to be replaced by blue grama in drier areas or places with increased grazing. This shorter grass often grows in association with needle-and-thread and threadleaf sedge (*Carex filifolia*), especially around the extremely dry edges of buttes and small tables. On gravelly soils, side draws, and broad swales, little bluestem becomes dominant, often in association with side-oats grama (*Bouteloua curtipendula*), both of which are fire tolerant species (FEIS 1996).

Unique and predictable grassland associations include switchgrass, which occurs in very wet, shallow basins, and western wheatgrass / green needlegrass, which is present on selected hills, slopes, and buttes. The western wheatgrass / green needlegrass association is present on small rises and slopes of the North Unit and in somewhat flat sites with more soil moisture on buttes in the South Unit. These grassland communities are fire tolerant (FEIS 1996).

Prior to the park's establishment agricultural or transportation activity disturbed approximately 5,100 acres that has been primarily re-vegetated by non-native grass species. Representative locations include road corridors in the park seeded with smooth brome (*Bromus inermis*), old fields in the North Unit seeded with crested wheatgrass (*Agropyron cristatum*), and old pastures on Sheep Mountain Table grazed by sheep and invaded by Kentucky bluegrass (*Poa pratensis*). The lack of fire in the early part of the 1900s allowed these cool-season exotic grasses to become well established and encroach into the surrounding native grassland. Other relatively common non-native species found in various disturbed sites include alfalfa (*Medicago sativa*),

Canada thistle (*Cirsium arvense*), and giant ragweed (*Ambrosia trifida*). A biennial, yellow sweetclover (*Melilotus officianalis*) is an exotic that is widespread within the North Unit of the park.

Approximately 109,715 acres of the park remain unvegetated or sparsely vegetated. Drought-tolerant shrubs such as silverscale saltbush (*Atriplex argentea*) and broom snakeweed (*Gutierrezia sarothrae*) and annual forbs can be found dispersed throughout variable badland environments/habitats (Von Loh et al. 1999).

In summary, virtually all of the park's native species are fire tolerant and many are fire dependent to some extent (FEIS 1996). Those species that are not fire tolerant generally occur in areas that are not naturally prone to fire, such as floodplains and isolated juniper slumps.

Wildlife Resources

There are a variety of wildlife resources that occupy woodlands, shrublands, and grasslands of Badlands National Park, including small mammals, ungulates, birds, reptiles, amphibians and invertebrates. There are at least 55 documented mammalian species within the park including five species of ungulates, more than 120 species of birds, over 19 species of reptiles and amphibians, 28 known species of lepidoptera along with numerous other arthropod species. (Higgins et al., 2000; Smith, 1998).

Common small mammal species observed include the least chipmunk (*Eutamius minimus)*, eastern cottontail rabbit (*Sylvilagus floridus*), thirteen lined ground squirrel (*Spermophilus tridecemlineatus*), black-tailed prairie dog (*Cynomys ludovicanus*), deer mouse (*Peromyscus maniculatus*) and muskrat (*Ondontra zibehicus*) and numerous other smaller rodents. Common meso-carnivores include the coyote (*Canis latrans*), bobcat (*Felis rufus*), red fox (*Vulpes vulpes*) and American badger (*Taxidea taxus*).

Ungulates within the park include mule deer (*Odocoileus hemionus)*, white-tailed deer (*O. virginianus)*, pronghorn antelope (*Antilocapra americana)*, bison (*Bison bison)*, and Rocky Mountain bighorn sheep (*Ovis canadensis canadensis*). Bison were restored to the park in 1963 and now number more than 500 head. Bison management requires that a portion of the park be fenced. Water supplies and other factors require that the herd be limited to around 650 animals. Surplus bison are rounded up and transferred to tribal governments and other agencies. Bighorn sheep were also restored to the park in 1967 to fill the ecological niche formerly occupied by the now extinct Audubon's bighorn sheep and now number between 58 to 74 animals. The park is currently searching for other animals to translocate to Badlands National Park to boost the population genetically and reproductively.

Common amphibians found within Badlands National Park include the Plains spadefoot toad (*Scaphiopus bombifrons*), Great Plains toad (*Cognatus bufonidae*) and the chorus frog (*Pseudacris triseriata*). Some common reptiles include the red-sided garter snake (Thamnophis sirtalis), western plains garter (*Thamnophis radix*), western plains hinges (*Heterodox nascius*), bullsnake (*Pituophis melanoleuc*) and prairie rattlesnake (*Crotalus viridis*).

Common bird species within Badlands National Park include the Northern Harrier (*Circus cyaneus*), Ferruginous Hawk (*Buteo regalis*), Red-tailed Hawk (*Buteo jamaicensis*), Prairie falcon (*Falco mexicanus*), Sharp-tailed Grouse (*Tympanuchus phasianellus*), *Killdeer (Charadrius vociferus*), Mourning Dove (*Zenaida macroura*), Burrowing Owl (*Athene cunicularria*), Red-headed Woodpecker (*Melanerpes erythrocephalus*), Yellow-shafted Flicker (*Colaptes auratus*), Eastern Kingbird (*Tyrannus tyrannus*), Bell's Vireo (*Vireo bellii*), Warbling Vireo (*Vireo gilvus*), black-billed Magpie (*Pica pica*), American Crow (*Corvus brachyrhynchos*) Bank Swallow (*Riparia riparia*), Cliff Swallow (*Hirundo pyrrhonota*), Barn Swallow (*Hirundo rustica*), Mountain Bluebird (*Sialia currucioides*), American Robin (*Turdus migratorius*), Field

Sparrow (Spizella pusilla), Dickcisssel (*Spiza americana*), and Red-winged Blackbird (*Agelaius phoeniceus*).

Common butterfly species found within Badlands National Park include the Eastern Tiger Swallowtail (*Pterourus glaucus*), checkered white (*Pontia protodice*), cabbage white *(Pieris rapae*), clouded sulphur (*Colias philodice*), Striped Hairstreak (*Satyrium liparops*), Melissa Blue (*Lycaeides melissa*), Regal Fritillary (*Speyeria idalia*), Atlantis Fritillary (*Speyeria atlantis*), Variegated Fritillary (*Euptoieta claudia*), Pearl Crescent (*Phyciodes tharos tharos*), Wiedemer's Admiral (*Basilarchia weidemeyerii*), Viceroy (*Basilarchia archippus*), Mourning Cloak (*Nymphalis antiopa*), Red admiral (*Vanessa atalanta*), Painted Lady (*Vanessa cardui*), Hackberry Emperor (*Asterocampa celtis*), Common Wood Nymph (*Cercyonis pegala*) Common CheckSkipper (*Pyrgus communis*) and the Delaware Skipper (*Anatrytone logan*). Several species of grasshoppers and crickets (Orthoptera) along with elm leaf beetles (*Pyrrhalta luteola*) and elm bark beetles (*Scolytus multistriatus*) are also common within Badlands National Park.

Threatened and Endangered Species

NPS policy states that national parks must give state-listed species the same consideration as federal-listed species. Several federal and state listed species are known to exist in and around the Badlands National Park area and utilize a variety of habitats within the system. The federally threatened / state endangered bald eagle (*Haliaeetus leucocephalus*) is a migrant or winter resident in mature riparian woodlands, and occasionally uses prairie dog colonies. The federal and state endangered whooping crane (*Grus americana*) makes use of shallow, sparsely vegetated wetlands, wet meadows, and agricultural fields during spring and fall migrations. The state endangered peregrine falcon (*Falco peregrinus*) may nest on shelves or in crevices in the rugged badlands features and forage in open grasslands during its seasonal residency. The federally endangered American burying beetle (*Nicrophorus americanus*) utilizes moist grassy areas. Although this beetle was historically found in the area, its status today in the Badlands is unknown. The state listed "species of management concern" black-tailed prairie dog (*Cynomys ludovicanus*) is a social, burrowing, resident rodent species that utilizes low lying, grassland areas within the local landscape in fragmented towns that cover approximately 2% of the total park acreage. Black-tailed prairie dogs are currently considered "warranted but precluded from listing" by the US Fish and Wildlife Service while plains states work to develop individual management plans to ensure its survival as a species. The Buffalo Gap National Grassland/Badlands National Park prairie dog population is one of the largest complexes in South Dakota, which makes this area essential habitat for the endangered black-footed ferret (*Mustela nigripes)* a nocturnal member of the weasel family and resident obligate predator of prairie dog towns. Black-footed ferret re-introductions occurred in Badlands National Park from 1994-1999. Current population estimates are 5-15 individuals within Badlands National Park and an additional 200 individuals on the surrounding Buffalo Gap National Grasslands. This is the largest free-ranging wild population of black-footed ferrets in North America.

The South Dakota state-threatened swift fox (*Vulpes velox*) is a small canine that utilizes open grasslands and dens in burrows, generally in and around prairie dog towns. Swift fox are known to reside locally, but population status is unknown. The US Fish and Wildlife Service recently reversed an earlier decision that the swift fox warranted listing, and has determined that it should not be considered for federal listing. There are occasional sightings within the park of the state threatened mountain lion (*Felis concolor*), but the remnant local population is likely juvenile dispersers expanding out from the Black Hills and/or the Cheyenne River.

Air Quality

Historically, the park and surrounding area have enjoyed excellent air quality, with only occasional, short-term air pollution from transient wildland fire smoke and blowing dust. National Park Service fire management activities which result in the discharge of pollutants (smoke, carbon monoxide, paticulates, and other pollutants from fires) are subject to, and must comply with, all applicable federal, state, interstate, and local air pollution control requirements as specified by Section 118 of the Clean Air Act, as amended (42 USC 7418). As legally designated wilderness, the Badlands Wilderness Area is designated as a Class I area under the Clean Air Act, prohibiting significant deterioration of air quality. Because Badlands was a national monument when the Clean Air Act was enacted, the remainder of the park is a Class II area.

It is likely that pre-Columbian visibility was lower than current levels due to frequent fires in summer months. A permanently mounted 35mm camera was used between 1987and1995 to monitor visibility near the northeast entrance. Transmissometer data from 1988 to the present has also been used to monitor visibility. The park has 5 years of ozone monitoring data and is currently adding to 12 years of Interagency Monitoring of Protected Visual Environments (IMPROVE) data (1988-present). During the ozone-monitoring period, Badlands had some of the lowest average ozone concentrations in the NPS monitoring network (NPS 1998). The ozone levels measured are well below those found to damage sensitive plants. Similarly, wet deposition data does not indicate significant acidic deposition, at the present. More recent data may indicate an increase in the presence of atmospheric nitrates. Nitrate and sulfate emissions from regional-scale sources such as industrial and electric utility facilities in eastern Wyoming and western South Dakota are of significant concern to the Badlands airshed, and these emissions are on the rise.

Paleontological Resources

The White River Badlands region contains the largest assembly of known late Eocene and Oligocene mammal fossils. The area is the birthplace of vertebrate paleontology in North America beginning with the description of a titanothere mandible in 1846 by Dr. Hiram Prout. Since then numerous important finds from the area have served to define the geologic period. Oligocene fossil remains include camels, three-toed horses, oreodonts, antelope-like animals, rhinoceroses, false deer, rabbits, beavers, creodonts, land turtles, rodents and birds.

Marine fossils are found in deposits of an ancient sea that existed in the region some 80 to 65 million years ago during the Cretaceous period. Fossils found in the Pierre Shale and Fox Hills Formations include ammonites, nautiloids, fish, marine reptiles and turtles.

The spectacular vertebrate fossils preserved within the White River Badlands have been studied extensively since 1846 and are apart of museum collections throughout the world. Small percentages of the Badlands National Park have been surveyed for fossil resources. Most of these areas consist of historic research sites (Clark et al., 1967) and small-scale projects completed by individual contracts and paleontological interns (Terry, 1995; Cicimurri, 1995; Lala 1996; Martin and McConnell, 1997; Martin and DiBenedetto, 1997,1998). A pre-construction survey was completed along the Badlands Loop Road in 1996, 1997 and 1998 (Benton, et al. 1998). A three-year baseline survey of fossil bone beds in the Scenic Member of the Brule Formation began in the summer of 2000. Very little paleontological data has been entered into the park GIS system. More paleontological sites will be recorded in GIS once the GIS program has fully expanded.

Wilderness

Wilderness was legally designated in Badlands National Park in 1976 (PL 94-567). The Badlands Wilderness Area (BWA or Wilderness) encompasses nearly 64,250 acres in two units,

the Sage Creek Unit (approximately 54,000 acres) and the Conata Unit (approximately 10,000 acres). See Fig. 2 on page 10 of the Fire Management Plan for boundaries of the wilderness units.

The BWA contains extensive badlands features, but also has expanses of rolling prairie. No permits are required for hiking or camping in the BWA, so data for visitor use is lacking. However, mostly due to the high summer temperatures, few access points, limited water sources, and biting insects, visitation is quite low and limited mostly to the Sage Creek Unit. Most visitors only view the Wilderness from viewpoints along the Loop and Sage Creek roads. Few people hike, camp, or ride horses in the BWA. The primitive automobile-access Sage Creek campground off the Sage Creek Road is the primary access point for hikers and horse users venturing into the Wilderness.

There are no trails or facilities in the Wilderness, but because of the great sight distances human intrusions (ranch buildings and lights, telecommunications towers) from outside the park can be seen from several points within the BWA. Vehicles on park roads can also be seen from parts of the Wilderness. Also, both units are fenced along the boundary where necessary to keep bison in and cattle out. Pre-existing water impoundments are considered essential to maintaining the bison herd and bighorn sheep populations, so explosives are used to clear sediments from impoundments identified as wildlife watering sources.

Overall, human presence in the Wilderness is very limited, and the chance of one visitor group encountering another in the core of the Sage Creek Unit is slight. The greatest human presence is likely management activities in the form of paleontological research, exotic plant control, and black-footed ferret monitoring. Previously, (1993-1999) intensive management for black-footed ferret re-introductions (predator exclosures around prairie dog towns) and associated research (exclosures for determining the effects of prairie dogs on vegetation), as well as pre-Wilderness homestead barbed wire fencing, were the greatest intrusions in the wilderness character. With ferret re-introduction success the predator exclosures have been removed, as has much of the fencing. There is little remaining evidence of the cattle grazing, haying and homesteading that existed in some of the area in the earlier part of the twentieth century.

For the most part, wilderness attributes, such as opportunities for solitude, natural night sky, and natural soundscapes are well preserved within the Wilderness, particularly the larger and more rugged Sage Creek Unit.

Cultural Resources

Archaeological Resources

Badlands National Park lies in the Plains Culture Area. Archaeologists have defined the Plains Culture on the basis of the character of material remains from prehistoric sites and have outlined a sequence of changes in those remains. Documentation of these changes in association with materials that can be dated using absolute dating techniques (e.g., radiocarbon) has allowed archaeologists to assign a general time frame to variations in the material culture. Using these and other techniques, a broad sequence of culture history has been defined for the region and divided into four periods and/or cultural affiliations: Paleo-Indian (11,500 to 8,000 BP), Plains Archaic Tradition (8,000 to 1,500 BP), Late Prehistoric Period (1,500 BP to 1700s), and Protohistoric/Historic Period (1675 to1920s). The Archaeology of Badlands National Park, South Dakota (Hannus, et.al. 2003) notes:

> No archaeological cultures, phases, or complexes have yet been delineated that call the Badlands "home." The White River Badlands, although centrally located within the "Plains Region," are

generally understood as peripheral to many culture areas. This view implies a transitory or seasonal use of the region rather than year-round settlement.

Currently 10% of the land area within the Pinnacles and Cedar Pass Districts has been surveyed for archeological resources. Fieldwork for this survey was completed in 2000 as part of a 5-year study being conducted jointly by Augustana College and the NPS Midwest Regional Archeological Center (MWAC). A draft this report has been reviewed and the final is expected during summer, 2003. Prior to this survey, less than one percent of the total land area within the park had been surveyed for archeological resources. Less than 1% of the Stronghold District has been surveyed for archaeological resources. Most of the prior archeological surveys conducted in the park (Beaubien, 1953; Taylor, 1961; Britte, 1970; Kay, 1974; Falk, 1976; and Anderson, 1978) have been on a specific project-related basis in response to construction needs. The only exception to this is Britte's (1970) study at Site 39JK2. Two hundred eighty-three sites have been identified as of January, 2001. Site types are primarily lithic and artifact scatters. There are two identified historic farmsteads and two structures with wooden remnants. However, due to homesteading in the early 1900s, scatters of historic materials dot the prairie landscape, particularly in the Sage Creek area; 236 sites have fair to good documentation on file while 47 are considered poorly documented.

All archeological sites within the park are protected by federal legislation (Antiquities Act of 1906, 1979 Archeological Resources Protection Act, Executive Order 11593), Section 110 of the National Historic Protection Act and their management is guided by *NPS-28: Cultural Resource Management Guideline*. Further survey and evaluation of the park's archeological resources may also yield archeological remains that warrant future nominations to the National Register. To date, only one site has been evaluated for nomination to the National Register; however, it is ineligible due to impacts from the Badlands natural erosion which destroyed the integrity of the site. The research conducted by Brent Buenger in 2000 and 2001 determined that the short, superficial duration of prescribed fire presents only a minimal risk to archaeological sites. The primary impacts will result from off-road vehicle travel to support fire activities.

Cultural Landscapes

The park has not yet been inventoried for cultural landscapes. Identified potential cultural landscapes are:

- Historic fossil collecting camps. The locations of these camps is approximated from journals and field reports but have not been pinpointed.
- Fort Pierre to Fort Laramie Road. Documented in a masters thesis in 1975.
- Route of Bigfoot's Band through the White River Badlands to Wounded Knee. Location approximated from oral histories.
- Stronghold Table. Ghost dances held here in 1890 contributed to the events of Wounded Knee and are the last known such ceremonies of the 19th century.
- Cedar Pass Headquarters Area. Currently under evaluation through a Cultural Landscape Report and Environmental Assessment due to be completed in 2004.

Historic Structures

In 2002, the Ben Reifel Visitor Center was determined to be eligible for the National Register of Historic Places as a part of the plans to rehabilitate the Center. Consultation with the State Historic Preservation Office resulted in an approved construction plan with mitigation measures specified.

In 1975, the State Historic Preservation Office determined that the Cedar Pass Lodge was ineligible for the National Register of Historic Places due to extensive alteration to the structural

integrity and external appearance of the cabins and lodge buildings.

The List of Classified Structures for Badlands National Park was last updated in 1992 and requires updating. It lists three roads (Badlands Loop Road, Sage Creek Rim Road, and Sheep Mountain Table Road) and two structures (Tyree Gravesite and Homestead Well). Both structures are located within the boundaries of the Badlands Wilderness Area.

Ethnographic resources

American Indians use many areas within the park as spiritual sites. Activity at these sites usually consists of small offerings (often small packets of tobacco) tied to a tree or bush. Park staff is aware of the general areas where such activities take place. The park may have potential ethnographic landscapes as yet unevaluated.

Public Health and Safety

The area around Badlands National Park is very lightly populated, which reduces potential for public health and safety concerns arising from the park's fire program. Two small (less than 100 people each) towns, Scenic and Interior, are right on the park boundary, and the next closest town, Wall (approximately 1000 people) is 10 miles from the park. The rest of the nearby population consists of scattered ranches. Three important travel corridors cross through the park area in general east-west routes. Interstate 90 crosses within 10 miles of the park, and SD State Highway 44 passes through the thin "neck" of the park that joins the North and South Units. Highway 240 traverses through the North Unit of the park. Two other travel routes, BIA 27 (north-south) traverses the east side of the South Unit, and BIA 2 (east-west) traverses the south side of the unit.

ENVIRONMENTAL CONSEQUENCES

The National Environmental Policy Act (NEPA) requires that environmental documents disclose the environmental impacts of the proposed federal action, reasonable alternatives to that action, and any adverse environmental effects that cannot be avoided should the proposed action be implemented. This analysis provides the basis for comparing the effects of the alternatives. In considering the impacts both the intensity and duration of the impacts, mitigation measures and cumulative impacts were assessed.

Methodology

The NPS based this impact analysis and conclusions on the review of existing literature and park studies, information provided by experts within the National Park Service and other agencies, and professional judgements and insights of park staff.

Intensity

For the purposes of this analysis, intensity or severity of the impact is as defined as follows:

- *Negligible* - impact to the resource or discipline is barely perceptible and not measurable, and confined to a small area.
- *Minor* - impact to the resource or discipline is perceptible and measurable, and is localized.
- *Moderate* - impact is clearly detectable and could have appreciable effect on the resource or discipline.
- *Major* - impact would have a substantial, highly noticeable influence on the resource or discipline.

Duration

The duration of the impacts in this analysis is defined as follows:

- *Short-term impacts* occur during implementation of the alternative, including activities occurring during a fire (suppression or holding actions).
- *Long-term impacts* extend beyond implementation of the alternative and would likely have permanent effects on the resource or discipline.

Direct and Indirect Effects

- *Direct effects* are caused by the action and occur at the same time and place.
- *Indirect effects* are caused by the action, but occur later in time or are further are removed in distance, but must be reasonably foreseeable. Indirect effects may include changes in ecological processes that result in a change to the environment.

Vegetation Resources

Impacts to vegetation resources common to both alternatives:

Researchers are in agreement that fire provides an overall benefit to the continued growth, health, and maintenance of the mixed-grass prairie ecosystem. (Vogl, 1979, Wright and Bailey, 1980). Although there appears to be some conflict in research findings relative to whether fire benefits or harms particular species during specific stages of growth (and the degree of benefit or harm resulting to affected species), there is general agreement that fire plays an integral role in maintaining the mixed-grass prairie ecosystem. Collins and Gibson (1990) documented the need for an interaction of four different disturbance types, including fire, to maintain diverse community structure in mixed-grass prairie. In the absence of fire, species richness (the number of species per unit area), evenness (the distribution between dominance among species) and patch structure (the association of species at various spatial scales) may change. The absence of fire tends to increase woody species and reduce species richness and patch structure.

Given the rapid growth characteristics and the chemical composition of most mixed-grassland species, decomposition occurs slowly in the absence of fire in this ecosystem. Thus, fires have the direct effect of removing stagnant, dead plant accumulations while converting that mass to ash and charcoal. The blackened, burned areas protect underlying soils by joining remaining unburned vegetation and charcoal bits and help to raise the soil temperature by several degrees, particularly in the spring. The ash/charcoal material returns a number of minerals and salts to the soil, thus recycling them for new plant growth. Indirectly, the higher temperatures increase fungal, bacterial, and algal activity, which in turn increases available nitrogen. The increased microorganism activity also helps to increase soil temperatures while aiding in nutrient recycling. Fire generally improves mixed-grassland soils. In addition to increasing nitrification of the soils and increasing minerals and salt amounts in the soil, the ash and charcoal residue resulting from incomplete combustion aids in soil buildup and soil enrichment by being added as organic matter to the soil profile. The added material works in combination with dead and dying root systems to make the soil more porous, better able to retain water, and less compact while increasing needed sites and surface areas for essential microorganisms, mycorrhizae, and roots. In general, fires tend to stimulate plant growth, resulting in larger, more vigorous plants, greater seed production, and increased protein and carbohydrate contents. Fires tend to increase species diversity, and reduce woody species relative to grass and forb species. (Vogl, 1979; Wright and Bailey, 1980).

Research conducted at Badlands National Park indicates that western wheatgrass, threadleaf sedge, blue grama, chokecherry, and green ash are beneficially affected by fire, although

responses vary somewhat depending on seasonality, frequency, and soil moisture conditions. Needle-and-thread is relatively intolerant of fire and may be decreased (Whisenant, 1987(a); Hull-Seig, 1998). Research conducted outside the park support these general findings (Whisenant, 1987(b); U.S. Department of Agriculture, 2000).

Cool-season, non-native grasses are usually decreased by fire, although responses vary somewhat depending on seasonality, frequency, residence time, and soil moisture conditions. Research conducted at Badlands National Park indicates that Japanese brome is reduced by spring fire (Whisenant, 1987(a)). Research conducted outside the park indicates that Kentucky bluegrass, crested wheatgrass, smooth brome, and downy brome are also decreased by fire, particularly by repeated spring fires (Whisenant, 1987(b); U.S. Department of Agriculture, 2000). Most native grasses are warm season, and thus are not emerged when these spring fires occur and not affected.

Generally, a grassland without fire (either prescribed or natural) has an increased abundance of cool season non-native grasses, a lack of native forbs, and an increase in woody vegetation. As the National Park Service strives to restore and/or maintain naturalness at Badlands National Park, the altered condition of plant composition and distribution that would result from the suppression of all fires and an absence of prescribed fire would be a negative, long-term impact to vegetation resources.

Both alternatives provide for the use of prescribed fire for resource benefits. That is, prescribed fire may be used to stimulate the growth of native species or reduce the growth of non-native species, either directly or indirectly. This may be the primary goal of a prescribed fire, or a product of prescribed fire for fuel reduction. In many cases, a prescribed fire unit identified for fuel reduction would be burned during a specific season and with a specific ignition pattern based on the species composition, thus realizing both resource benefits and fuel reduction. Fire monitoring would continue to be used to assess the effects of fire on specific species, following a standard protocol (see Fire Management Plan, *Appendix F*). The direct and indirect effects of prescribed fires are generally beneficial to the native vegetation species, although individual plants of some species may be destroyed by fire. Indirectly, areas disturbed by fire may be prone to invasion by non-native species such as common mullein and Canada thistle. All prescribed burn units would be assessed before the burn and fire may be excluded from sensitive resources or non-native species populations that increase with fire. A post-burn survey would be conducted as part of the park's on-going weed management program, and non-native species would be treated with appropriate integrated pest management techniques.

Both alternatives provide for suppression of unwanted wildland fires that would have a direct negative effect on vegetation. The impact of suppression activities would be reduced by the use of minimum-impact suppression strategies. That is, suppression would generally favor wet-line (water) or scratch-line (hand tools) over fire breaks made by heavy equipment. The use of minimum impact suppression strategies would reduce the impact on vegetation resources. However, suppression activities would likely result in trampling or removal of vegetation and compaction of soil along routes of travel and fire lines, thus providing disturbed areas that may be invaded by non-native species such as Canada thistle, knapweeds, and field bindweed. Furthermore, suppression activities deny the benefits of fire to the vegetation resources.

Impacts of *Alternative A* on Vegetation Resources: Because this alternative does not allow for wildland fire use, all unplanned (human or natural) ignitions would be suppressed. Consequently, there would be increased suppression activities and increased impacts to vegetation resources than if the wildland fires were allowed to burn.

Conclusion: Due to the direct impacts of fire and equipment on individual plants and the indirect impacts on species composition of the fire dependent plant communities, implementation of this alternative would result in long-term, minor positive impacts to vegetation resources.

Impacts of *Alternative B* on Vegetation Resources: In the Natural Fire Management Unit, wildland fire use would be allowed. As such, natural ignitions may be allowed to burn within specified conditions. It is impossible to predict the impact on the park's vegetation resources from any given wildland fire. However, due to the fire dependent nature of most of the park's vegetation communities, wildland fire use is expected to have significant beneficial impacts to vegetation resources. Furthermore, wildland fire use would most closely simulate the natural fire mosaic that characterized the native Northern Great Plains.

Conclusion: Because more wildland fires would be allowed to burn, the proposed fire regime would more closely simulate pre-Columbian conditions, and potential for impacts from suppression equipment and activities would be less (compared to Alternative A), implementation of this alternative would result in long-term, major positive impacts to vegetation resources.

Wildlife Resources

Impacts to wildlife resources common to both alternatives:

Many researchers have documented that fire provides an overall benefit to the density, diversity, health, and maintenance of native prairie wildlife species. Fire can have direct mortality on small mammals, some invertebrates, reptiles, and amphibians and other non-mobile wildlife. Mobile species may be impacted indirectly by fire through reductions in the amount of potential nesting, resting and foraging habitat and by increased predation. These impacts are usually short-term. Conversely, fire can also provide excellent foraging areas for small mammals and many ungulates after the burn. In general, most researchers believe that fire plays an important role in maintaining the native prairie ecosystem and healthy diverse wildlife populations. Most divergence in philosophy between the positive and negative benefits of fire is found in differences of opinion on the intensity, duration and frequency of fire applied to a particular landscape or wildlife species; large, unplanned and uncontrolled fires can devastate small remnant native species populations. Smaller, managed fires create vegetation mosaics beneficial in the long-term to nearly all native species. Possible direct and indirect effects on some of the common small mammals, ungulates, birds, reptiles and amphibians found within Badlands National Park are discussed below.

Small Mammals

Wildland and prescribed fire may have some direct mortality on small mammal species, as individual animals may perish due to exposure to smoke, flames, or equipment. Indirectly, fire may impact the population as a result of reducing the amount of available cover and increasing the amount of predation by raptors and other animals. Rodent populations in grasslands usually show an initial drop after fire due to high amounts of raptor predation (Cook, 1959). Effects of fire on prairie dog towns are addressed in the "Threatened and Endangered Species" section below.

Fires that create a mosaic of burned and unburned areas are probably the most beneficial to small mammal species because their densities have been found to increase in areas where mosaics have been created following a burn (Landers, 1987; Taylor, 1981, Hooven, 1973, Cornely et al 1983). Several studies indicate that many small mammal populations increase rapidly subsequent to burning because of the resulting increase in the quality and quantity of food. As fire stimulates post-burn grass production, a corresponding increase in small mammal populations is evident.

One larger mammal species in the mesocarnivore category prevalent throughout Badlands National Park is the coyote (*Canis latrans*). Since coyotes prey upon many species in the small mammal category, fire may improve coyote foraging habitat and amount of prey available by

maintaining prey habitat and make hunting easier by opening up the habitat.

Ungulates

Fire probably does not have direct mortality on most healthy ungulates because they are able to move away from the flaming front and out of harms way. The fire may kill sick, diseased, or immobile individuals. However, there have been documented cases of mule deer being trapped and killed by fast-moving fires (Davis, 1976). Indirectly, fire may cause ungulates to concentrate in specific areas immediately after the burn to search for food or protective areas.

Effects of fire on mule deer and white-tailed deer habitat are widely varied and well documented in the literature. In general, fires that create mosaics of forage and cover are beneficial. Deer prefer foraging in recently burned areas (once regrowth begins) compared to unburned areas, although preference may vary seasonally (Davis, 1976,1975; Williams, et al., 1980). This preference may indicate an increase in plant nutrients, which usually occurs following fire. Burning in grassland communities reduces litter that otherwise inhibits new growth of grasses. This rejuvenates and improves these communities, which are important winter range in some areas, and can increase nutrient content and palatability of forage (Dasmann, 1963).

Pronghorn antelope are primarily a forb-eating species with strong requirements for open cover. Pronghorn are favorably influenced by the increase in herbaceous species and reduction of shrubs after fire. Nutritional benefits of fire on forage may last up to 4 years after the fire with an increase in primary productivity for a longer period depending upon plant species (Higgins, et al., 1989).

Bighorn sheep primarily graze grasses and forbs, but eat other vegetation depending on availability (Chapman, 1984). Bighorn sheep prefer green forage and move up or downslope or to different aspects for more palatable forage. Forage areas that provide a variety of aspects are preferable to sheep because they provide green forage for longer periods (Van Dyke, et al., 1983). Fire generally stimulates the growth of grasses and forbs, thus providing a green food essential for nutrition. No information is available regarding the direct effects of fire on bighorn sheep. In the Badlands sheep can easily reach escape terrain to avoid fire.

Fire exclusion, which has allowed non-native and tree species to establish on grasslands, has decreased both the forage and security values on many bighorn sheep ranges. Burning may regenerate rangelands and enhance the production, availability, and palatability of important bighorn sheep forage species. Burning can increase visibility for bighorn sheep. Research has shown that on many burned sites, bighorn sheep use areas more distant to escape terrain than on adjacent unburned sites. Fire can negatively affect bighorn sheep habitat: when range condition is poor and forage species cannot recover; when non-sprouting species that provide important forage for bighorn sheep are eliminated; or, when too much area is burned and forage is inadequate until the next growing season. Another potentially negative effect is when other species, such as deer, bison or antelope are attracted to prescribed burns intended to benefit bighorn sheep. Early spring fires, particularly on south and southwest aspects, may provide more spring forage than would otherwise be available for bighorn sheep if burning did not occur.

The bighorn sheep herd condition at Badlands National Park is currently in jeopardy due to low numbers, low reproduction and disease. Consequently, fires have the potential to significantly impact this small population.

Bison are also impacted directly and indirectly by fire. Fires commonly occur on bison ranges without causing appreciable bison mortality. Fire is important in creating and maintaining bison habitat by regenerating grasslands and enhancing production, availability, and palatability of many forage species. During pre-settlement times bison habitats were to a large extent created and maintained by lightning-caused fires or fires set by Native Americans. Several studies have

shown that bison prefer to forage on recently burned areas. During the first post-fire years following a fall prescribed fire in grassland habitat at Wind Cave National Park, bulls were found less often than cow-calf herds on burned sites. Both cow-calf herds and bull groups tended to use the burn more in June of the first post-fire season than at any other time. However, only cow-calf herds consistently grazed the burn during the rest of the summer (Coppock, et al., 1986).

Birds

Direct mortality from fire probably does not usually occur in most bird species because they are able to move out of harms way. Fire occurring during the nesting season may kill ground nesting bird species such as the sharp-tailed grouse and ferruginous hawk. Indirectly, fire may cause birds to nest in other areas immediately after the burn if specific nesting areas are burned. Fire may cause some nesting bird mortality from asphyxiation if they remain on their nest during a burn. However, this is not usually the case, and fire is believed by most ornithologists to be an important factor in creating and maintaining ground nesting bird habitat. Fires that reduce tall cover enhance lek viability and quality for the sharp-tailed grouse also, because these birds need open habitat with good horizontal visibility for lek sites. Much of the prairie habitat in which sharp-tailed grouse occur was largely maintained by fire in pre-settlement times (Grange, 1948). On native northern mixed-grass prairie in South Dakota, sharp-tailed grouse were absent in an unburned control area, which contained dense grass. They were present on a less dense burned area within a few months following the fire (Huber, et al., 1984).

Fire-related mortality of burrowing owl, another fairly common bird found throughout Badlands National Park, has not been documented in the literature. Burrowing mammals that stay in their burrows during fire are usually unharmed; burrowing owls in their burrows during fire probably are probably unharmed as well. Some burrowing mammals have asphyxiated in their burrows during fire and this may also happen to burrowing owls. When caught outside their burrows during fire, adult burrowing owls probably escape fire easily; some young that cannot yet fly may be injured or killed. Fire affects burrowing owl in two ways: by altering vegetation and by altering their prey base. Wright and Bailey (1982) identified three major fire-dependent plant associations (grassland, semi-desert grass-shrub, and sagebrush-grass) in which burrowing owls occur. They found that frequent fire can maintain or improve burrowing owl habitats by reducing plant height and cover around burrows and by controlling woody plant invasion. Periodic fire in grasslands probably increases prey diversity for raptors including burrowing owl, and may increase overall prey density. After a 1- to 3-year reduction in prey, rodent numbers usually match or exceed pre-fire levels. Also, at Badlands, burrowing owls are general found in prairie dog towns where vegetation is kept cropped and are thus not likely to support fire.

Reptiles and Amphibians

Very little information is available in the literature on the direct effects of fire on snakes, lizards and turtles but in general, there may be some direct mortality. Small microhabitat areas near and in woody draws and cedar slumps that do not support frequent fires build up high fuel loads. These areas support a more homogeneous, hotter fire, which may have a detrimental effect on turtles because brush fires can be lethal to turtles because they move so slowly (Gibson et al., 1990). Fragments of tortoise shells have been found in burned areas (Woodbury et al., 1948). Indirectly fire may impact the snake, lizard, and turtle populations as a result of lowering the amount of foraging cover, thereby increasing predation by raptors and other animals. Very little information is available in the literature on the direct effects of fire on frogs and newts. The fact that there are no reports of high mortality for any herptile species may indicate that many amphibians are not highly vulnerable to fire (Means et al., 1981). Indirectly fire may impact amphibian population as a result of lowering cover and increasing predation by

raptors and other animals.

Invertebrates

The direct and indirect effects of fire on invertebrates are variable. There may be some direct mortality of larvae and adults insects from fire. Generally, however, insect populations in grassland habitats recover quickly from fire. Most grasshopper species increase after spring fire due to increased nutritional quality of new grasses. On native tallgrass prairie in Kansas, grasshopper numbers were highest after early spring prescribed burning, followed by mid-spring burning. Grasshopper numbers were lowest on late-spring burned sites. In a review of fire effects on insects, Warren and others reported that grasshoppers and crickets (Orthoptera) generally increase after fire in any season; however, "hot" grass fires that occur before Orthoptera have developed wings may reduce their numbers.

Impacts of *Alternative A* to wildlife resources: Because this alternative calls for suppression of all wildland fires, suppression activities involving mechanized equipment could impact and potentially disturb many wildlife species. Also wildland fire suppression is completed under situations when pre-burn surveys are difficult if not impossible to perform. Fuel loads would increase to abnormally high levels under this alternative because of continued suppression, and fire would not be permitted to burn in areas where it historically occurred naturally. Prairie habitats and forage would not be rejuvenated in large portions of the park in a pre-Columbian timeframe, thus negatively impacting many species. Consequently, when fire did occur, it would burn longer and at higher temperatures, causing increased erosion and more resource damage. Alternative A would have a greater negative impact on the wildlife resource and, in many cases, in areas that cannot be monitored easily.

Conclusion: Based on the potential benefits of habitat improvements in parts of the park, continued degradation in others due to fire suppression, and the potential impacts from greater suppression activities, long-term, major negative impacts to wildlife resources would likely occur.

Impacts of *Alternative B* to wildlife resources: Because this alternative allows for wildland fire use in the Natural Fire Management Unit, the greatest impact to wildlife resources would be the wildland fires in areas that would be difficult to effectively monitor and perform pre- and post-burn surveys. Therefore, it is impossible to predict the impact on the park's wildlife resources from any given natural ignition. However, due to the fire dependent nature of most of the park's vegetation communities, it is expected that wildland fire use would be significantly beneficial to native prairie wildlife resources. Furthermore, wildland fire use would most closely simulate the natural fire mosaic that characterized the native Northern Great Plains during pre-European settlement times.

Conclusion: Based on the potential benefits of habitat improvements gained through more extensive fire on the landscape, a long-term, major positive impact to wildlife resources would occur.

Threatened and Endangered Species

Impacts to threatened and endangered species common to both alternatives:

Since bald eagles, peregrine falcons, and whooping cranes are not known to nest in the area, there would be no impact expected on these species. During some grass fires with heavy fuel loads and high heat intensities, isolated trees may perish and become standing snags. These snags would benefit raptors in the form of perching sites. Due to the rapid mobility of avian species, they would escape from the direct dangers of fire. The American burying beetle can fly to avoid fire, and its larvae are buried below ground, so fire would likely have no impact. Prairie dogs, ferrets, mountain lions and swift fox are also very mobile and would utilize underground

burrows and badlands topography as escape cover from fire and not be effected by burning. Topography and other physical barriers such as drainages and vegetation generally limit the size and extent of prairie dog colonies. The boundary edges of towns generally contain higher vegetation that provides terrestrial predators the ability to approach prairie dogs undetected. The burning of this vegetation would increase prairie dog ability to detect these predators and possibly reduce predation. Prairie dogs have historically colonized areas of grassland disturbance associated with bison and cattle overgrazing (Hoogland, 1995). Areas burned by fire would be a benefit to prairie dogs in the form of a disturbed area that provides nutritious re-growth, high levels of predator detection, and a direction for colony expansion/colonization. The short-term immediate loss of cured forage caused from the burn would be offset by the benefits of the green re-growth. Black-footed ferrets, being obligates of the prairie dog, would also benefit by the potential increase of habitat in the long-term and the increased prey base in the short-term. Swift fox commonly inhabit areas with a high proportion of edge. Fire that creates a mosaic of burned and unburned areas is probably the most beneficial. The potential decrease in the amount of prairie dogs as prey for swift fox after a burn, associated with less cover for foxes and increased predator avoidance by the prairie dogs, would be offset by the increased detection by foxes of other small mammals and birds as prey.

Both alternatives include some wildland fire suppression. Fire suppression in grasslands is detrimental to populations of small bird and mammal herbivores due to organic matter accumulation and reduced plant vigor (Wagle, 1981). The techniques of grass fire suppression generally entail the use of direct attack with water and flappers, or indirect with fire lines and back-burns. Due to the rough landscape of the area, hand crews conduct suppression activities, and create minimal damage to the landscape. The short-term disturbances to threatened and endangered species, and their habitats, by these human activities would be minimal in comparison to the flame and smoke associated with the wildland fire. Any bald eagles, peregrine falcons, or whooping cranes will have fled the area during the fire, and most likely would not be affected by suppression activities. Prairie dogs, black-footed ferrets, mountain lions, and swift fox will have fled the area or gone below ground during the fire, and most likely would not be affected by suppression activities.

Impacts of *Alternative A* to threatened and endangered species: The impacts of fire in the grasslands landscape produce overall benefits to the habitats of the concerned threatened and endangered species at Badlands National Park. Suppression of all wildland fires has the potential to decrease this benefit. Prescribed burning on boundary areas might offset this decrease. A small amount of stress would be placed on individual animals in the form of energy demands during fire avoidance and/or human avoidance during suppression activities, but poses little risk to populations. Consultation with the U.S. Fish and Wildlife Service (Larson, 2001) concerning these specific impacts produced agreement with the following conclusion.

Conclusion: Based on the benefits of habitat improvements gained through fire on the landscape, and the short-term, minor negative impacts on individuals, implementation of this alternative may affect, but is not likely to adversely affect, threatened and endangered species.

Impacts of *Alternative B* to threatened and endangered species: Similar to the fire effects in Alternative A, this alternative would show a similar response by threatened and endangered species and their habitats with the exception that a possibly greater benefit could be gained utilizing fire as a resource management objective by burning to increase and improve natural habitats. The decrease in the amount of fire suppression in wildland fire use areas would also decrease any negative impacts caused by these human activities. Consultation with the U.S. Fish and Wildlife Service (Larson, 2001) concerning these specific impacts produced agreement with the following conclusion:

Conclusion: Based on the benefits of habitat improvements gained through fire on the

landscape, and the short-term, minor negative impacts on individuals, implementation of this alternative may affect, but is not likely to adversely affect, threatened and endangered species.

Air Quality

Impacts to air resources common to both alternatives:

Both alternatives include the use of prescribed fire. The State of South Dakota requires that the park inform the State Department of Air Quality prior to performing prescribed burns. Burning permits are not required. The park would also notify local Federal Aviation Administration offices so pilots may be made aware of possible temporary visibility impairments. Smoke drift affecting neighbors and public roads is also a concern. Smoke dispersal would be a consideration in determining whether or not a prescribed burn is within prescription, as described in the specific prescribed fire plan. For either wildland fires or prescribed fires, the fine-grass fuels in the park generate low volumes of smoke for short duration and are not usually a smoke management problem.

Impacts of *Alternative A* to air resources: Because this alternative calls for suppression of all wildland fires, the duration of smoke generation and resulting impacts to air resources would be less than if there was wildland fire use.

Conclusion: Due to the generation of smoke for short durations during prescribed fires and wildland fires before suppression, implementation of this alternative would result in short-term, minor impacts to air resources.

Impacts of *Alternative B* to air resources: Because this alternative would allow wildland fire use in the Natural Fire Management Unit, the duration of smoke generated during a fire use event would generally exceed the duration of smoke generated by a wildland fire that is immediately suppressed. Fires may be allowed to burn for days under appropriate conditions, while most fires in grassland fuels are suppressed within a day and most prescribed fires last for less than a day.

Conclusion: Due to the generation of smoke for short duration during prescribed fires and wildland fires before suppression, as well as the potential for slightly longer duration of smoke during wildland fire use (fires allowed to burn), implementation of this alternative would result in short-term, moderate negative impacts to air resources.

Paleontological Resources

Impacts to paleontological resources common to both alternatives:

Due to the extreme surface temperatures associated with grassland fires (Lata, 1997), paleontological resources exposed at the surface may undergo splitting, cracking and discoloration when exposed to fire. This is especially the case where bedrock outcrops in heavy fuel areas. However, most surficial fossils are found in poorly vegetated bedrock sites. Due to the buffer created by overlying bedrock, fossils in the subsurface are probably not impacted by fire.

Under both alternatives, prescribed burns around the park perimeter have the greatest impact on fossil resources. Both vehicle and foot traffic can impact delicate fossils exposed on the surface. To prevent the potential crushing of fossil remains, no vehicle traffic would be allowed in badlands areas associated with a burn and foot traffic would be limited. Areas recommended for hand lining, trenching, and heavy equipment operation would be identified in a burn plan and reviewed by the park Paleontologist.

As a regular practice, because of the potential impact on exposed fossil resources, pre-burn surveys and potential removal of fossils would be implemented before a prescribed fire is

initiated. Careful consideration would be made on the scientific significance of specimen found and the type of fire that would come in contact with the specimen. If a significant site is found, that site would either be protected from fire encroachment or would be excavated. Long range goals include developing burn areas that do not come in direct contact with badlands and creating barriers to protect badlands areas from fire.

Impacts of *Alternative A* to paleontological resources: Alternative A has the greatest impact on fossil resources through active suppression of wildland fires and associated suppression activities that could destroy exposed fossils.

Conclusion: Based on the likely disturbance of exposed fossils on the surface in this alternative, long-term moderate, negative impacts to paleontological resources would occur.

Impacts of *Alternative B* to paleontological resources: Prescribed fires and wildland fire use may both impact exposed fossils, primarily on the bedrock/prairie interface at the edge of many fires. However, most fires would not reach exposed fossils in the poorly vegetated bedrock where fossils are found. Also, since badlands interface will be used as fire breaks whenever possible, suppression activities in badlands will be minimal and will be avoided.

Conclusion: Based on the potential disturbance of exposed fossils on the surface in this alternative, long-term, minor negative impacts to paleontological resources may occur.

Wilderness

Impacts of *Alternative A* to Wilderness: This alternative would necessitate immediate, full suppression of all wildland fire in the Wilderness. The immediate result would be an impact to the Wilderness from suppression activities, which, depending on determinations of “minimum tools” necessary to suppress fire, could include helicopter use and mechanized equipment. The result would be a short-term negative impact to visitor experience (visual and noise intrusions) for any visitor within the wilderness when suppression activities were conducted, and potential long-term impacts from tracks and other evidence of suppression activities that may

detract from wilderness character for several years.

Conclusion: Due to potential for long lasting impacts from suppression activities, this alternative would have long-term, moderate negative impacts.

Impacts *Alternative B* to Wilderness: This alternative may result in more frequent prescribed fires, but because the burning conditions would be carefully controlled, and natural ignitions within the Wilderness would be allowed to burn unless they threaten property outside the park, fire management and suppression activities would be less impacting than under Alternative A. Mechanized equipment would be avoided within the Wilderness. Fires allowed to burn would have a short-term impact on wilderness users with reduced visibility from smoke. Prescribed burns and wildland fire use may also restrict visitor use at times. There would be no long-term impacts on the wilderness visitor experience because there would be no mechanized equipment used, except in extreme conditions.

Conclusion: Because of the prolonged (by days) impacts of smoke, due to wildland fire use, and possible restrictions to visitor use, this alternative would have short-term, minor negative impacts and long term, major positive impacts on naturalness of wilderness.

Cultural Resources

Archaeological resources

Under both alternatives, prescribed burns around the park perimeter have the greatest impact on archaeological resources. While vehicular traffic can have a damaging impact on fragile surface remnants, foot traffic would not likely cause excessive damage. To prevent the potential crushing or scattering of archaeological resources, vehicle traffic should be kept to a minimum and avoid areas of known historic resources. Areas recommended for hand lining, trenching, and heavy equipment operation must first be reviewed by the park Cultural Resource Specialist and approved by the park Superintendent.

Prescribed burning in grassland fuels produced relatively low temperatures and residence times (Buenger, 2001). Based on these observations, it is our conclusion that prescribed burning in mixed grass fuels presents only a minimal risk to surface artifacts and little or no risk to subsurface artifacts. Because archaeological resources are not consumed by fire, the impacts are considered moderate in nature.

To facilitate the decision making process during any proposed or occurring fire event, a detailed set of digital cultural resource maps needs to be developed and incorporated into the park's geographic information system (GIS). The data set should include location, site number, site type, and site evaluation. This information could then be readily available for prescribed fire planning and to incident commanders for wildland fire management. These digital maps should also include information that would identify preferred fire management activities in regard to specific sites and site types. Actions that could be identified include site avoidance (buffer area), use of physical or applied barriers, mechanical reduction of fuel loads, collection of certain artifact classes prior to burn, follow-up survey, and collection post-burn. However, the impacts to these resources through fire management activities will not consume the resources. Even tests on wooden artifacts indicated minimal impact through the duration and temperature of prairie fire. Although this information will assist in management of cultural resources, they are not critical to making a well reasoned decision relating to fire management.

Cultural Landscapes and Ethnographic Resources

The park has not yet been inventoried for cultural or ethnographic landscapes. Since this type of historic resource can vary dramatically in purpose and in story, it cannot be predicted what impact fire would have on these potential resources. However, since fire was historically a part

of the American Indian heritage on the plains, it is possible that fire could help restore certain landscapes to their historic appearance. Additionally, since the resources are not likely to be consumed, the impacts are considered moderate.

Historic Structures

Specific fire management activities will be managed to avoid any structures or features on the List of Classified Structures or structures eligible to the National Register. As a matter of course, wildland fires are managed to avoid destruction to government property.

Impacts of *Alternative A* to cultural resources: Alternative A has the greatest impact on cultural resources through active suppression of wildland fires. Bulldozers and the construction of fire lines could impact historic and ethnographic resources. Because wildland fire suppression is completed under emergency situations it is difficult to complete the pre-burn surveys and monitoring needed.

Conclusion: Based on the potential disturbance of exposed artifacts, cultural landscapes, and ethnographic resources in this alternative, long-term, moderate negative impacts to archaeological resources would occur. During fire, these resources are not consumed, resulting in a moderate impact.

Impacts of *Alternative B* to cultural resources: The greatest impact to cultural resources under Alternative B would be the initiation of prescribed burns within the remote areas of the wilderness area. These areas are difficult to access. It is a challenge to effectively document sites or recover artifacts during pre-burn surveys without great cost and effort. Use of helicopters should be examined as appropriate under the provisions of wilderness management. Access to sacred sites may be impacted and offerings left behind could be consumed. These activities are typically not performed in the prairie environment; however, because access to sites may be impacted and offerings left behind could be consumed, the park must make every effort to insure that users are aware of proposed fire activities.

Conclusion: Based on the potential disturbance of exposed artifacts, cultural landscapes, and ethnographic resources in this alternative, long-term, moderate negative impacts to archaeological resources would occur. During fire, these resources are not consumed, resulting in a moderate impact. Based on the potential consumption of religious offerings, long-term, moderate negative impacts to ethnographic resources would occur.

Public Health and Safety

Impacts common to both alternatives:

Since both alternatives involve the use of prescribed fire around much of the park boundary, there is approximately equal potential in each alternative for problems associated with smoke and escaped fires burning into towns or ranches. Poorly dispersed smoke from prescribed fires can settle over nearby sites and sustained breathing of smoky air can cause severe respiratory ailments, particularly in children and the elderly. It can also cause visibility hazards on nearby roads. Since the number of acres to be burned via prescribed fire is approximately the same in each alternative, the impacts to public health and safety from prescribed fire is also the same.

Impacts from *Alternative A:* Because this alternative does not allow for wildland fire use, there would be less chance for problems associated with smoke. Wildland fires would be fought aggressively in every case, and thus there would be less potential for fires to reach the size where smoke would be a significant issue. Impacts from this alternative are likely to be short term and minor.

Impacts from *Alternative B:* Because this alternative includes wildland fire use, there is a

greater potential for smoke from naturally-ignited fires allowed to burn in the Wilderness to settle over a town or ranch, or impair visibility on one of the main transportation routes. However, the likelihood of a significant amount of smoke impacting homes, schools or roads for any extended period of time (more than an hour or two) would be slim. Therefore, impacts from this alternative would be expected to be short term and minor.

Mitigation Summary for Preferred Alternative

Mitigation measures to reduce impacts are included in the preceding discussion of environmental consequences specific to each impact topic. In many cases the same mitigation measure may serve to reduce impacts on a number of resources. To reiterate, those actions are presented below by mitigation measure, rather than impact topic. Specific mitigation measures to be utilized for individual fires will be identified in the prescribed fire plan or determined for the specific wildland fire use fire when needed.

Pre-burn Vegetation Surveys:

Prior to completion of the Burn Plan for a Prescribed Burn, the site would be surveyed to:

- Identify locations of fire intolerant, desirable native plant populations. The burn would be planned to exclude fire in those areas as feasible.
- Identify locations of non-native species populations that may increase with fire. The burn would be planned to exclude fire in those areas as feasible.
- Identify long-term research plots that may be adversely affected by fire. The burn would be planned to exclude fire in those areas as feasible.
- Identify and salvage, as appropriate, fossils that would be impacted by fire. If a significant site is located, the site may be excavated or fire may be excluded in that area.
- Identify and salvage, as appropriate, archaeological artifacts that would be impacted by fire. If a significant site is located, either fire would be excluded from that area or it would be subject to a full site assessment including the impact fire would have specifically on the type of resources associated with the site.

Post-burn Vegetation Surveys:

- A post-burn survey would be conducted as part of the park's on-going weed management program, and non-native species would be treated with appropriate integrated pest management techniques.

Smoke Management:

- All prescribed fire plans will include prescriptions for appropriate smoke dispersal to avoid impacts to park neighbors.

Holding Crews:

- All prescribed fire plans will include identification of needed holding personnel based on formulas developed by the National Wildfire Coordinating Group. The fire will not be conducted without the identified resources in place and ready to prevent escapes.

Designate Routes of Travel:

- In prescribed burns, the information collected in the pre-burn survey would be used to designate routes of travel and/or restrict travel in areas that contain resources that could be crushed.

Use of Minimum Impact Suppression Strategies:

- Favor wet-line or scratch-line (hand tools) over fire breaks made by heavy equipment.
- Areas recommended for hand lining, trenching, and heavy equipment operation must first be reviewed by the park Paleontologist, Cultural Resource Specialist and approved by the Superintendent.
- Suppression activities in Wilderness would be subject to a minimum tool analysis.

Long-range Paleo Protection:

- Long-range goals include developing burn areas that do not come in direct contact with badlands and creating barriers to protect badlands areas from fire, and comprehensive parkwide paleo surveys to identify and document significant fossil locations.

Long-range Development of GIS Data:

- A detailed set of digital cultural resource and paleontological spatial data needs to be developed and incorporated into the park's geographic information system (GIS). These digital data should also include information that would identify preferred fire management activities in regard to specific sites and site types. Actions that could be identified include site avoidance (buffer area), use of physical or applied barriers, mechanical reduction of fuel loads, collection of certain artifact classes prior to burn, follow-up survey, and collection post-burn. Until a comprehensive set of data for the park is created, each prescribed fire plan will ensure information is known for that specific fire.

Cumulative Effects Analysis

Cumulative impacts are described in regulations developed by the Council on Environmental Quality (CEQ), 40 CFR 1508.7. A cumulative impact is the impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of who undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Cumulative impacts were determined by combining the impact of the project alternatives with potential impacts of other past, present and reasonably foreseeable future actions. Therefore it was necessary to identify, other ongoing or foreseeable future projects within the surrounding region. The projects identified include:

Badlands National Park General Management Plan

Badlands National Park has begun preparation of a General Management Plan (GMP) for the park. The GMP will provide overall guidance of the park for the next twenty years. The plan will look at alternative ways of managing the park, and is expected to be completed in 2002. The GMP will have an accompanying environmental impact statement prepared evaluating its potential impacts. Because the General Management Plan is incomplete at this time, and the nature of the effects on resources is unknown, it is difficult to predict what cumulative impacts may be posed by the implementation of both the General Management Plan and the Fire Management Plan's Preferred Alternative.

It is likely that the General Management Plan will anticipate and accommodate increased visitation. This increased visitation may result in increased emissions from vehicles, thus an impact on air quality. The cumulative effects of increased emissions from visitor vehicles and emissions from fire events could be adverse, although it is difficult to predict the magnitude of emissions. Smoke from prescribed fire events would generally occur in spring and fall when visitation is generally moderate. During the peak visitor season of mid-summer, smoke would generally be from wildland fires that could occur in absence of this Fire Management Plan. Adoption of the preferred alternative of the Fire Management Plan would implement a fire prevention strategy that would decrease emissions caused by wildland fires overall. Increased visitation may result in a small amount of increased use of the Badlands Wilderness Area, although use is currently very low and additional visitor use can be easily accommodated without having a negative effect on the wilderness experience.

Other impacts associated with the General Management Plan may be the construction of new visitor facilities. In most cases, new construction would occur in existing developed areas, for example adding restroom facilities to an overlook that already includes a parking lot and paths. As a result of locating new construction in developed areas, the potential to impact vegetation or wildlife would be minimized. As a standard policy, all ground disturbing activities, such as would be associated with new construction, are reviewed by the park Paleontologist and Cultural Resource Specialist. As needed, excavations are monitored by paleo and/or archaeological monitors to protect those resources. Due to the limited extent of new construction likely to be proposed by the General Management Plan and the monitoring protocols already in place, significant cumulative impacts to vegetation, wildlife, paleontological resources, and cultural resources are not anticipated.

Energy Development Proposals

There are several proposals for energy development that may impact Badlands National Park, primarily from the aspect of air quality. These proposals include coalbed methane development in the Powder River Basin of Wyoming and Montana (2 EISs have been developed by the Bureau of Land Management), the WYGEN II power generating plant (Wyoming state permit), and the Dakota, Minnesota and Eastern (DM&E) Railroad being developed to haul coal from Wyoming to generating plants in Wisconsin.

The DM&E is seeking a permit from the Surface Transportation Board (STB) to reroute and upgrade a railroad from Wyoming to Minnesota. The primary purpose of this railroad is to transport coal to the east (Wisconsin, Illinois) to supply power plants. The preferred alternative places the railway corridor within two miles of the western boundary of Badlands National Park. The National Park Service reviewed the Draft Environmental Impact Statement (DEIS) prepared on the proposed railroad expansion. NPS comments were submitted as part of the Department of the Interior's response on the DEIS. Based on review of the DEIS, the NPS is concerned that the project would result in impacts to air quality, would increase noise in the Badlands Wilderness Area, provide a corridor for the expansion of exotic plants, and has the potential to cause wildland fires. STB has pushed for permitting the railroad expansion over the NPS concerns. The Final EIS did not fully address NPS concerns.

Extensive coalbed methane development has been proposed for southeastern Montana/northeastern Wyoming. Over 50,000 wells are planned. NPS has found the two EIS's for the project do not adequately address air quality concerns in Class I parks (Badlands and Wind Cave). NPS does not feel BLM has been responsive to our concerns.

The cumulative effects of the DM&E railroad project and other energy development efforts, and the implementation of the preferred alternative of the Fire Management Plan would have adverse effects on air quality. However, the emissions from the trains, generating plants and gas wells would be more long-term and persistent than the short duration of smoke generated

by very infrequent fire events. In addition, DM&E would have negative cumulative impacts to wildlife, particularly mammals; however, the disturbance to wildlife posed by the trains would be more long-term and persistent than the rather short duration of impacts caused by fire events. These two projects would have the cumulative effect of causing a change in plant species. Implementation of the Fire Management Plan would restore a fundamental natural process to the grasslands, thus having the beneficial effect of increasing vigor of native species, increasing species diversity, and increasing the diversity of plant communities due to the mosaic pattern caused by burning. The DM&E railroad project would have adverse impacts on plant communities by increasing the spread of non-native species, particularly tamarisk and Canada thistle.

Impairment

Under NPS *Management Policies*, Section 1.4 *et seq.* (2001), park managers must determine if management activities constitute impairment to park resources. To quote, “The impairment of park resources and values may not be allowed by the Service unless directly and specifically provided for by legislation or by the proclamation establishing the park." *Policies* defines impairment as “an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values.”

Adoption of the preferred alternative, Alternative B would not constitute an impairment of the resources and values Badlands National Park was established to preserve. In fact, the purpose of the Fire Management Plan is to implement a program that enhances the integrity of park resources and the ecosystem with which they are linked by restoring an essential natural process. In the case of non-renewable resources such as paleontological and archeological resources, actions would be taken in conjunction with adoption of this fire management strategy to mitigate the potential negative impacts to significant resources.

CONSULTATION AND COORDINATION

In accordance with the Endangered Species Act of 1973, Section 7 consultation with the U.S. Fish and Wildlife Service concerning impacts to threatened and endangered species was initiated during the writing of this EA (Larson, 2001). Once the final EA is completed and published, the U.S. Fish and Wildlife Service will have the opportunity to comment and concur with the findings, and thus completing consultation requirements. U.S. Fish and Wildlife Service comments and recommendations will be included with the final Fire Management Plan and EA.

In accordance with Section 106 of the National Historic Preservation Act, consultation with the State Historic Preservation Officer was initiated in January 2001. That office will be provided a copy of the entire Fire Management Plan, including this Environmental Assessment, for review and comment during the public review period. The comments of the State Historic Preservation Officer will be included with the final Fire Management Plan and EA.

The Northern Great Plains Fire Management Office has consulted with Oglala Sioux Tribe authorities during the course of preparation of this plan. Consultation will continue throughout the public involvement process.

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- Doug Albertson, Wildlife Biologist
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